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The Use and Abuse of Dietary Standards

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IT IS my purpose to introduce to you a new dietary standard for Canada which will shortly be published as Volume 2, No. 1, of *The Canadian Bulletin on Nutrition*. It has been prepared by the technical committee of the Canadian Council on Nutrition and approved by the Council as a whole for the Department of National Health and Welfare.

Before proceeding to analyse the new standard, however, I should first review the confusion in thought which has surrounded and obscured the whole question of standards and recommended dietary allowances. In 1935 Burnet and Aykroyd made a report to the Assembly of the League of Nations drawing the attention of its members to the possibilities of great improvement in public health through better nutrition. The Council of the League set up a "mixed" committee on this problem which, with the assistance of several bodies such as the International Labour Office, the International Institute of Agriculture and a technical commission of scientists, submitted a report in four parts to the Assembly in 1936. In volume II entitled "Report on the Physiological Basis of Nutrition" (1) there is set down a scale of dietary standards of *average values* which would represent the requirements in terms of calories and protein of members of a human population, subdivided on the basis of age, sex, body weight and activity. No quantitative expression of the requirements of fat, minerals or vitamins was given at that time. The standard is specifically stated to represent average values within specific categories and in terms of food actually assimilated, i.e., edible portion, presumably with deductions for alimentary losses. In the same report there is the statement that these expressions represent "not the indispensable minimum, but the optimum diet as the standard now held to be necessary." There are no definitions of the words, minimum or optimum.

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In 1936 Orr (2) published his book, *Food, Health and Income* in which he drew the sweeping conclusions that in the United Kingdom the average diet of the poorest group, comprising 4½ million people, was deficient in every dietary essential examined. Even in the wealthiest group, comprising only 10 per cent of the population, complete adequacy was not attained. Orr specifically defined his standard as a diet which would keep people in a state of health or well-being such that no improvement could be effected by a change in dietary intake. Again there is no clarification of the term, improvement, or the means of assessing it. Orr adopted the specific dietary requirements of Stiebeling (3), proposed in 1933. These differ from those of the League of Nations.

The Canadian Council on Nutrition drew up its own dietary standard in 1939 (4). For the sake of uniformity it replaced this standard in 1942 by the one postulated by the Food and Nutrition Board of the National Research Council of the United States in 1941 (5). These standards are the most extensive thus far proposed and they have been changed several times. I shall quote several sentences from the 1945 revision which have been overlooked by many users of these "standards."

"It seemed preferable . . . to formulate allowances suitable for maintenance of good nutritional status."

"The allowances are intended to serve as a guide for planning an adequate diet for *every normal person* of the population and *not* for the average member of the group categories."

"While the allowances do not provide a basis for judging nutritional status of populations, they nevertheless serve as a guide for feeding population groups."

In 1945 these standards were considered by the members of the Canadian Council on Nutrition to be too high in many respects and inadequate in others, and a new statement was prepared and published (6). This statement tended to assign a range, rather than a specific amount, on the basis that normal physiological requirements vary, even within the group category. Pett (7) and Pett, Morrell and Hanley (8) pointed this out in 1945, stating that the distribution of the requirement for any one dietary element would take the form of a Gaussian curve if our knowledge of the requirements of single individuals was sufficiently exact and extensive. Obviously individual intakes should not be evaluated in terms of the mean alone but of the complete curve and with other associated evidence.

Let us now consider the uses to which these standards may be put. They are essentially four: (1) calculation of the nutrient requirements of a homogeneous group or population with respect to the formulation of their food supply as in terms of a ration; (2) evaluation of the dietary status of a homogeneous group of people from the total and average quantities of foods eaten; (3) formulation of regulations under the Food and Drugs Act governing the content of foods, dietary supplements or drugs, and of permissible claims for them, and (4) evaluation of the dietary status of an individual person from the foods purchased or eaten, or for educational purposes in this respect.

Careful consideration of the possible uses will readily differentiate the

first two from the last two. It is very unlikely that a single set of figures could be used correctly for all of these purposes. I quote from the last published statement of the Council (6):

"If people are maintaining an approximately normal weight and if they are healthy, it is probable that their caloric intake equals their energy requirements. Under these conditions, observed intakes can be taken as an index of caloric requirements. Two recent surveys are in good agreement with regard to the caloric supplies of presumably normal girls aged 12-15. The mean intake was found to be 2400 calories with a standard deviation of 400. Observed intakes were distributed equally on both sides of the mean. It might then be said that the average caloric requirement of girls of those ages is 2400 cals. per day. If food supplies were planned for a group of girls 12-15, it would be satisfactory to do so on the basis of 2400 calories per girl per day. . . . The mean value of 2400 calories is, then, a useful figure in planning food supplies. Since the data show a distinct variation in *individual* requirements, as would be expected, the mean value should not be used as a criterion of adequacy of *individual* food supplies. For example, a girl using 2100 calories per day might or might not have a deficient supply but the deficiency could not be determined by comparing the intake to the *average* requirement for a large group."

Herein lie the differences and misuse of dietary standards. The figures given in the statement of the League of Nations are averages applicable to groups. The figures in the recommended dietary allowances of the U.S.A. are a mixture but for the most part a maximum designed for individuals and they have a very limited use for purposes one and two as stated above. The assessment of the individual requirements provides the greatest difficulty without the use of extensive and sometimes questionable methods of evaluating nutritional status (9, 10).

It was on this false basis of comparison that the four Canadian dietary surveys of 1939 led to the conclusion of extensive dietary deficiencies in Canada (11). The same conclusion has been applied to certain surveys in Ontario. The error is unfortunately widespread and Wilder has stressed this fallacy (12) for the American recommended allowances.

Individual variation is governed by several factors, notably age, sex and muscular activity. Such physiological states as pregnancy and lactation must be recognized. A notable variant has, however, been neglected as applicable to human beings in the factor of body weight—or, more strictly, "metabolic size". It has been recognized by animal husbandrymen for some time past and the feeding of domestic animals has been more scientific than the feeding of children. The new Canadian standard incorporates this factor and thus attempts to solve the requirements of the individual and the group. The figures may also be used to indicate a "nutritional floor" beneath which maintenance of health in individuals cannot be *assumed*. The statement incorporates the proposed standards for adults and for juveniles with calories, protein, calcium, phosphorus and vitamin A in relation to body weight, and thiamine, riboflavin and niacin in relation to the caloric equivalent of the diet. Standards for other nutrients are stated in less exact terms due to our

present lack of knowledge. The theoretical basis for the standards is incorporated in appendices. There are two graphs which permit of rapid assessment of requirements in relation to body weight for adults (80 to 220 lbs.) and for juveniles (20 to 120 lbs.). The same result may be obtained from the tables or by calculation from the biological constants given in the appendices. The basis for these graphs is a state of "maintenance living" defined as that which does not involve nutrient expenditure for reproduction, lactation or muscular work other than associated with an inactive existence. The latter incorporates basal metabolism, plus specific dynamic action and the muscular activity involved in dressing and undressing, one hour; sitting, seven hours; walking slowly, two hours; and standing, four hours. For a man of average weight (70 kg.) the energy requirement for maintenance would be the basal rate increased by one third or

$$\text{Calories} = 93 W_{\text{kg.}}^{0.75} = 2251.$$

To this standard of maintenance must be added a suitable allotment for "work" in terms of calories. The great diversity of work and the difficulty of estimating its intensity are obvious limitations on the accuracy of all such calculations.

Dietary protein is calculated in grams in terms of body weight as 2.75 ($W_{\text{kg.}}^{0.75}$), = 67 gms. for an average man.

Vitamin A is calculated as International Units of carotene on the basis of 72 I.U. per kilogram of body weight or 5040 I.U. for an average man.

Having determined the energy requirement of an individual or the average of a group, it is possible to calculate the B vitamins on the basis of

- 0.3 milligram per 1000 calories for thiamine,
- 0.5 milligram per 1000 calories for riboflavin,
- 3.0 milligrams per 1000 calories for niacin.

Calcium and phosphorus are accepted as required in approximately equal amounts and are allotted on the basis of 0.01 gram per kilogram of body weight. Other essential nutrients are listed in single terms at present and, for an adult man, they are in part

- 30 milligrams of ascorbic acid,
- 6 milligrams of iron.

Children are treated in a simpler manner by chart or table according to weight and sex. The states of pregnancy and lactation require special supplements to be added to the requirements of maintenance plus work.

While a little practice will permit of the use of these new standards, a word of caution is in order. The figures extractable from these charts and tables are no more accurate than the basic data from which they have been constructed. In many cases the fundamental data are inadequate and in others there is considerable disagreement. As an example, the allowance for thiamine is set at 0.3 milligram per 1000 calories, yet there is evidence to support a figure of 0.2 and the American allowance is 0.5. Ascorbic acid is set at 30 milligrams per day although the American recommended allowance is 75 and English workers claim that 10 are sufficient. Many such instances could be cited. This variation is shown in Table I.

TABLE I
EVOLUTION OF STANDARDS FOR ADULT MAN (70 KG.)
AT SEDENTARY OCCUPATION

	League of Nations 1935	Canadian Council on Nutrition				U.S.A.	
		1939	1942	1945	1949	1945	1948
Calories	2,400	2,400	2,500	3,000*	2,476	2,500	2,400
Protein (gm.)	70	70	70	90*	67	70	70
Fat (gm.)	—	80	—	—	70	56-70	53-67
Ca (gm.)	—	0.6	0.8	0.6	0.7	0.8	1.0
Fe (mgm.)	—	10	12	6	6	12	12
Vitamin A (I.U.)	—	6,000	5,000	3,000	5,040	5,000	5,000
B ₁ (mgm.)	—	1.6	1.5	0.9	0.73	1.2	1.2
B ₂ (mgm.)	—	—	2.2	1.5	1.2	1.6	1.8
Niacin (mgm.)	—	—	15	—	7.3	12	12
C (mgm.)	—	60	75	50	30	75	75

*Moderate activity.

The Council believes that a consideration of body weight is a step forward in deducing requirements for individuals, as well as for groups, but even this consideration does not account for all individual variation and there is ample evidence to show that in the case of calcium and other nutrient elements the same individual will assimilate a variable amount from day to day on a constant diet. Much still remains to be learned and nutrition is still a young science.

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A Health Service for Federal Government Employees

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Civil Service Health Division

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IN May, 1945, by Order in Council the Civil Service Health Division was established within the Department of National Health and Welfare and made responsible for the promotion and conservation of the health of civil servants and other Government employees. The objectives and functions of the health and welfare program to be undertaken were defined in considerable detail, but, broadly speaking, comprised the prevention and control of disease, the emergency treatment of sickness and accidents, the environmental and sanitary supervision of public buildings in which civil servants work, and finally the furnishing of advice respecting living accommodation, nutrition, recreation and other factors affecting health and welfare.

From the outset the distribution of the Government employee population in Canada has been the predominating factor in our planning and organization. The Federal Government is one of the largest employers of labour in Canada. Approximately 120,000 civil servants are dispersed from coast to coast. Employees of certain Crown companies and corporations may also request participation in this service, resulting in an over-all total of almost 150,000. The largest concentration, some 30,000, is located in Ottawa. Other concentrations, varying from 5,000 to 10,000 employees, are located in each of the large cities in Canada, depending on their size. It is estimated that almost 80,000 to 90,000 civil servants, or nearly two-thirds of the total, are concentrated in these large cities. It is among these large concentrations of Government employees that the bulk of health and welfare problems arise. It is here that our plans have called for our major efforts. It must also be borne in mind that the Government working force is divided among 25 to 30 different Government departments. In effect, therefore, our Division is called upon to administer an industrial health program for some 25 to 30 individual industries or departments, each enjoying administrative autonomy. The Civil Service Health Division is fortunately responsible to the Cabinet through the Minister of National Health and Welfare. It is not responsible to any Government department and hence is free of departmental control. This is the only arrangement whereby our divisional headquarters could adequately control and maintain supervision over our widely

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scattered Health Units and Branch Centres, which form an integral part of our future expansion program.

In view of the nature of the population to be served and with the above considerations forming a background and foundation, the Division commenced to develop a comprehensive and positive preventive health program. At the present time our Division affords what might be termed a basic service to the whole Government employee force across Canada. This group includes all employees coming under the jurisdiction of the Civil Service Commission for employment and discharge, and a small number of employees of Crown companies and agencies on whose behalf the Division's service has been specifically requested by the agency concerned. The service rendered embraces review and tabulation of medical certificates of disability for leave and retirement, statistical health studies, health education in the form of pamphlets, radio addresses, and publications in Civil Service organs, special examinations for purposes of advising Government departments on suitability for employment, investigation with recommendations into working environment, advice to Government departments on physical requirements for specific types of employment, and a general advisory service to Government departments on health factors in employment. This basic service may be looked upon as a protection of the employer's interests and an advisory service in such fields as are his responsibility.

In addition to the above a more complete service is rendered to some 30,000 Government employees in the Ottawa area, comprising all regular civil servants and a small number of employees exempt from civil service regulations employed in agencies such as the Canadian Broadcasting Corporation, National Film Board and other small Crown corporations which do not maintain their own medical service. This extra service is largely clinical in nature, providing a complete diagnostic service, including laboratory and X-ray facilities. It also includes sanitary inspection of Government buildings, advice on industrial hygiene in conjunction with the Industrial Health Division and its associated Industrial Health Laboratory, conduct of first-aid classes, lectures and demonstrations, and all other activities relating to a health promotion program.

To administer the above phases of our program, a Health Centre or medical centre combining the administrative headquarters and the clinical facilities of the Division was established in Ottawa. The Health Centre, forming the nucleus of our health set-up, staffed by physicians, specialists (including psychiatrist, psychologist and part-time radiologist), nurses and welfare supervisor, provides a consultative and advisory service on an outdoor basis.

A section of the Health Centre designated as the Certificate Review Section is responsible for the review and processing of all medical certificates received from across Canada. Pertinent statistical information on causes of illness, sickness absenteeism and injuries on duty is compiled, tabulated and analyzed by the Dominion Bureau of Statistics.

The Health Centre, with its professional staff, carries out routinely complete physical examinations for permanent appointment, pre-placement examinations at the request of departments, compulsory examinations and necessary

immunization procedures on personnel proceeding abroad or on isolated duty, examinations and investigations at the request of civil servants where indicated and finally emergency treatment in the case of injury or sudden illness on the job.

It must be emphasized that our Division provides only emergency medical and surgical care. It is not the aim or purpose of this Division to interfere in any way whatsoever with medical services ordinarily rendered by the practising physicians of the community. The scope and nature of our treatment is limited to minor conditions which can be treated on the job and is directed towards reducing unnecessary absenteeism. On occasion, upon the written request of the private physician, our staff physicians or nurses will render minor therapeutic procedures.

It will be argued that ideally and in accordance with sound industrial health practice, such a program should include routinely pre-employment examinations. This is a most desirable objective and one which we hope to accomplish eventually, but in view of the large turn-over rate among temporary Government employees, the state of our present organization and clinical facilities, and the widely scattered nature of the population to be served, the undertaking of this task is not possible at present.

Additional to the basic and extra services of a clinical nature outlined, nursing counsellor service is rendered to over 15,000 employees, constituting approximately one-half of the total number of Government employees in the Ottawa area. This represents only one-sixth of the entire population to be served. When you compare the extensive industrial health set-up which would be required to provide a similar service to 15,000 industrial employees, you will realize the magnitude of our full-scale program when completed.

This Nursing Counsellor service is provided by the establishment of Health Units which have been set up in Ottawa largely on a geographical basis, but where feasible, on a departmental basis. These Health Units are staffed by graduate nurses, known as Nursing Counsellors, who have been carefully selected both for their professional qualifications in public health nursing and personal suitability for this exacting work. Nursing Counsellors are appointed on the scale of one to every 600 to 700 employees. At the present time thirteen Health Units are functioning in the Ottawa area. Projected plans call for the establishment of approximately twenty-five Health Units in all to serve the total Government employee population in Ottawa. Health Units and the resulting Nursing Counsellor service are the foundation or corner-stone of the whole health program. Nursing Counsellors provide first-aid in case of minor illness and accident, maintain quiet rooms for the care of temporarily ill or indisposed employees, and conduct a health counselling service. Counselling may be defined as the art, technique or skills whereby one interprets and makes available her knowledge and resources to individuals who want them. True counselling is designed to assist the employee into constructive consideration of what to do with his immediate problem and to clarify basic issues involved, thereby preparing him to deal with his own future adjustments. Other duties include proper staff relations with supervising sections and departmental heads,

the promotion of a positive health education program, and the improvement of working conditions in their areas. Nursing Counsellors also check on persons leaving work on account of illness and returning to work following absence on account of illness. Visits to Nursing Counsellors by employees are made for a variety of causes, ranging from the above mentioned return-to-work visits to visits made specifically for consultation, advice and guidance on matters pertaining to the physical well-being, mental health or welfare of the employee. Employees requiring clinical investigation or consultation with our specialist services are referred by Nursing Counsellors to the Health Centre.

The inauguration of this program, and in particular the Health Centre and Health Units, has necessitated the institution of a complete set of records and forms similar to those required in any industrial medical service. Employee Health Record forms and Welfare Folders, Daily Tally Sheets, Monthly Health Unit Summary forms, interdepartmental and interdivisional Referral Forms, to mention a few, all have had to be devised in connection with the operation of our Health Centre and Health Units. New Physical Examination Record forms and Physician's Certificate of Disability forms have been designed to replace obsolete forms to conform with the policy of this Division. The net result will be to ensure that over a period of time valuable statistical material will be available for analysis and study. In all this work great care has been exercised in developing a system of records which will be both comprehensive and practical, but not too complicated or elaborate.

In the execution of this program and its expansion to include all Government departments, a fact has been noted which is of sufficient significance to stress. It has been found exceedingly important to maintain constantly satisfactory relations with departmental heads, just as in industry where complete understanding and co-operation on the part of management is essential. Without such relationship any medical service is doomed to failure. Our best relations with departments have occurred where the original arrangements for the introduction of our service have been made at top level and supported by a comprehensive discussion of purposes, procedure and policy with personnel or executive officers. It is, however, of equal importance that departments understand the difference between administrative assistance and convenience. The divisional service will bog down if departments are allowed to shift their responsibility for making administrative decisions in health and welfare matters to this Division. In all instances our role of acting in an advisory capacity to departments must be rigidly adhered to.

Having described very briefly the objectives, organization and administration of our program up to its present developmental state, it may be of interest to give a short account of the services rendered by the Health Centre and Health Units and the incidence and types of absenteeism which have occurred in the Government Service during the past fiscal year ending March 31, 1949. Sufficient time has not elapsed for detailed study of the morbidity data to be conducted. However, certain interesting observations can be made from the provisional data available. Before considering a few tables showing these observations, the Civil Service regulations respecting sick leave, recently

revised by the Civil Service Commission, after consultation with this Division, should be noted. Sick leave in the Civil Service accumulates at the rate of one and a half days for each completed month of continuous employment, totalling eighteen days per annum. Should an employee be sick for a period of more than three days at any one time, a medical certificate of disability, completed and signed by a duly registered physician, must be furnished. Such an illness is classified for our purposes as a "certified illness". Unlike statutory or vacation leave, sick leave can be carried over from year to year, there being no limit to the amount of leave credit which can be accumulated. Casual leave is merely sick leave for short absences of three days or less, and requires only a declaration on the part of the employee. However, should the casual absences on account of illness in one year exceed eight days, medical certification similar to that for certified illness must be furnished. Where an employee who has not exceeded the eight-day allowance of casual leave, furnishes a certificate following an absence of three days' duration or less, such an absence is not charged against his eight-day casual leave allowance. This accounts in the tables presented for the appearance of certified illness of less than four days' duration. The statistical data presented deal with certified illness only and do not include casual absences, which up to the present time are not reported routinely by departments to either the Civil Service Commission or to our Division. For this reason we are unable as yet to compute disability, frequency or severity rates, or assess with accuracy the total time lost due to illness. During the four-year period 1935-39, the average amount of time lost per person due to casual leave, as indicated in studies conducted by Dr. F. S. Burke, was 1.5 days. By adding this figure to the average days lost per person due to certified illness as

TABLE I
DEPARTMENT OF NATIONAL HEALTH AND WELFARE
Civil Service Health Division
HEALTH CENTRE STATISTICS
Fiscal Year 1948-49

Items	Total
TOTAL VISITS	5,267
Male	3,626
Female	1,641
First visits	3,447
Repeat visits	1,820
PHYSICAL EXAMINATIONS	
Pre-employment, permanency, etc.	1,641
Obligatory examination with immunization	56
Voluntary	203
Other	280
OTHER SERVICES	
Accident, industrial	76
Accident, non-industrial	201
Immunization	743
Consultation interview, etc.	2,067
DISPOSAL	
Return to work	5,157
Sent home	100
Referred to family physician	237
LABORATORY PROCEDURES	3,525
X-RAY	4,270

reported on medical certificates, an approximate estimate of the average days lost per person per annum can be arrived at.

Table I summarizes the work conducted at the Health Centre. In all, 5,267 employees have been referred to the Health Centre for examination or consultation by our staff physicians or consultants. Over 2,000 cases were referred by Nursing Counsellors or departmental officers for investigation of, or consultation with regard to, some specific health or welfare problem of mind or body affecting their daily work.

Some 4,200 X-rays were taken, of which over 90 per cent were chest films. Our X-ray program is limited to miniature chest X-rays, 14 x 17 chest films and diagnostic work chiefly of an emergency character. Routine films are taken on all individuals presenting themselves for physical examination in connection with permanency, isolated duty or foreign travel. All working contacts of detected cases are X-rayed as part of our tuberculosis control program. In addition small departmental surveys are carried out as warranted but facilities do not permit the undertaking of large-scale surveys in the Government population. Apart from chest films, 250 employees were X-rayed for a variety of conditions, usually a result of injury or accident.

Table II presents a summary of the visits made to our Health Units in

TABLE II
DEPARTMENT OF NATIONAL HEALTH AND WELFARE
Civil Service Health Division
HEALTH UNIT STATISTICS
Fiscal Year 1948-49

Items	Total
TOTAL VISITS	67,591
Male	27,072
Female	40,519
NATURE OF VISITS	
First visit	47,723
Repeat visits	19,868
Illness	26,710
Accident	8,252
Consultation	8,919
Return-to-work visits	23,710
Days lost due to casual absence	24,322
CLASSIFICATION	
Respiratory	12,844
Digestive	6,140
Non-respiratory and non-digestive	
Skin and cellular	2,794
Menstrual disorders	3,721
Emotional disorders, nervousness	902
Ill-defined and all others	15,613
NON-INDUSTRIAL INJURIES	3,843
INDUSTRIAL INJURIES	1,826
CONTAGIOUS DISEASES	40
DISPOSAL	
Sent home	1,614
Return to work	65,977
REFERRALS	
Referred to Health Centre	839
Referred to family physician	3,481
NO. OF PERSONNEL UNDER SUPERVISION	13,656

operation in the past fiscal year, 1 April 1948 to 31 March 1949. In all, 67,591 visits have been made to our units, broken down, as will be observed in the table, by sex, nature and classification of visit, and disposal. It will be observed that the male to female ratio is approximately 2 to 3. The distribution of the Government employee population in Ottawa as of December 1947, is males 53 per cent, females 47 per cent, whereas for the whole of Canada the distribution is males 70 per cent, females 30 per cent. Of this over-all total approximately 47,700 were recorded as first visits or visits resulting from new disabilities. The remainder were recorded as repeat visits to the Nursing Counsellor for further treatment or care of a previously reported condition. Respiratory diseases, digestive diseases, diseases of the skin and cellular system, and menstrual disorders constitute the bulk of the visits made to our Health Units. The ratio of respiratory to digestive diseases is approximately 2 to 1. It has been reliably reported that psychosomatic disorders occur in 30 per cent of the industrial population at large. Our experience reveals that 23 per cent of all visits are classified by the Nursing Counsellor as "ill-defined". It is the opinion of our Nursing Counsellors that the vast majority of these visits have an emotional background.

It is of special significance that almost 66,000 employees or 97.4 per cent were returned to work following consultation or medical care at the Health Unit. Had these employees not been able to seek advice and receive medical attention from the Nursing Counsellor, an appreciable number undoubtedly would have left work unnecessarily. It is a reasonable assumption that our service has materially reduced mean days lost from illness and contributed substantially to the over-all efficiency of the Government employee.

Tables III, IV, V and VI present an analysis of certified illness and absenteeism occurring in the Civil Service during the fiscal year ending 31

TABLE III
SICKNESS IN THE CIVIL SERVICE OF CANADA
April 1, 1948 - March 31, 1949

Items	Total
Number ill on medical certificates	32,317
Per cent ill only once	71.4
Per cent ill more than once	28.6
Total number of illnesses	47,254
Duration of illness	Per cent of illness
1-3 days	23.7
4-9 days	37.9
10-30 days	26.8
Over 30 days	11.6
Total number of days lost	716,653
Duration of days lost	Per cent of days lost
1-3 days	3.0
4-9 days	15.3
10-30 days	29.4
Over 30 days	52.3
Average days lost per illness	15.2
Duration of days lost	Average days lost
1-3 days	2.0
4-9 days	6.1
10-30 days	16.6
Over 30 days	68.3

March, 1949. These statistical studies are based on a Civil Service population of approximately 96,000, all of whom come under or adhere to the Civil Service regulations for sick leave. They do not include those 25,000-odd exempt or hourly paid employees who are not required to furnish the usual medical certificate of disability. It will be noted that over 32,000 or only one-third of the employee population are sufficiently ill to furnish a medical certificate during the year and of this total only 30 per cent or roughly 10,000 are ill on more than one occasion. The number of illnesses reported totalled 47,254, accounting for 716,653 days lost, an average of 15.2 days lost per illness.

The illnesses have been broken down into durations of 1 to 3 days, 4 to 9 days, 10 to 30 days and over 30 days, and the per cent of total illness and per cent of total days lost for each of these durations is shown in Table III. Approximately 11 per cent of the total number of illnesses are of over 30 days' duration. This group accounts for over one-half of the total days lost and averages 68.3 days per illness. In this group a relatively small number of illnesses with long duration account for this high average; e.g., tuberculosis of the bone—275 days; pulmonary tuberculosis—365 days plus; endocarditis—110 days, cerebral thrombosis and hemorrhage—183 days, and cancer—273 days.

Table IV reveals the percentage distribution of sickness in the Civil Service by broad classes in accordance with the International Statistical Classification of Diseases, Injuries and Causes of Death. It is significant that 42 per cent of the total number of illnesses reported were due to diseases of the respiratory system, accounting for 23 per cent of the total days lost, whereas just over 13 per cent of the total number of illnesses reported were due to diseases of the digestive system, accounting for 13 per cent of the total days lost. Diseases of the circulatory system accounted for only 4.7 per cent of the total number of illnesses reported but were responsible for 11.2 per cent of the total days lost. These and other interesting observations may be made from a study of this table.

TABLE IV
SICKNESS IN THE CIVIL SERVICE OF CANADA
Percentage distribution by classes
April 1, 1948 - March 31, 1949

	Percentage distribution Illnesses	Percentage distribution Days lost
Respiratory system	42.4	23.1
Digestive system	13.3	13.7
Accidents and injuries	7.0	8.1
Bones and organs of movement	5.6	6.4
Circulatory system	4.7	11.2
Symptoms and ill-defined	4.6	3.4
Nervous system and sense organs	4.0	4.6
Genito-urinary system	3.9	4.0
Skin and cellular tissue	3.9	3.0
Mental, psychoneurotic, and personality disorders	3.7	7.4
Infective and parasitic	2.7	7.3
Allergic, endocrine system, metabolic and nutritional diseases	1.7	2.4
Neoplasms	1.4	3.7
Blood and blood-forming organs	.8	1.4
Complications of pregnancy	.2	.2
Congenital malformations	.1	.1

Tables V and VI set forth the percentage distribution of illness by sex and duration. Bearing in mind the female to male population ratio of 30 to 70, it is significant that females accounted for 43 per cent of the total number of illnesses reported, representing a thirty per cent increased incidence of illness in females. Females were responsible for only 36 per cent of the total time lost. It follows therefore that females show a greater tendency to illness of short duration, particularly of 1 to 3 days' and to a lesser extent of 4 to 9 days' duration. This latter fact is amply demonstrated in Table VI.

TABLE V
SICKNESS IN THE CIVIL SERVICE OF CANADA
April 1, 1948 - March 31, 1949
Distribution of Illness by Sex

	Illness		Days Lost		Employees Per cent
	Number	Per cent	Number	Per cent	
Male	26,785	56.7	460,602	64.3	70.0
Female	20,469	43.3	256,051	35.7	30.0
Total	47,254	100.0	716,653	100.0	100.0

TABLE VI
SICKNESS IN THE CIVIL SERVICE OF CANADA
April 1, 1948 - March 31, 1949
Percentage distribution by duration of illness, by sex

Time lost	Percentage distribution of illness		Percentage distribution of days lost	
	Male	Female	Male	Female
*1-3 days	18.5	30.5	2.2	4.7
4-9 days	38.7	36.8	13.9	17.9
10-30 days	29.2	23.7	28.3	31.2
Over 30 days	13.6	9.0	55.6	46.2
Total	100.0	100.0	100.0	100.0

*NOTE: These figures represent certified illness only.

In closing, I would like to state that our plans for the future call for an expansion of the program described with the formation of Branch Health Centres and Health Units in the large cities throughout Canada. Such expansion can only be achieved when the benefits of our service have been conclusively demonstrated to the Government as an employer. Such benefits as evidenced by reduction in absenteeism with increased efficiency and production cannot be evaluated overnight, in black and white, or in dollars and cents but must await a satisfactory trial period. A health program based on the prevention of disease and the promotion of better health among Civil Service employees, intelligently used, can be expected to result in reducing absenteeism from illness and assist employees in performing their duties efficiently and economically. Any improvement in the general health of Government employees will consequently be to the advantage of the Government and the taxpayer as well as to the employee himself.

Finally I wish to express my thanks to Dr. R. G. Ratz, Chief of the Civil Service Health Division, for his suggestions in the preparation of this paper, and to Dr. Mary Ross and her assistants for their valuable contribution in the collection, tabulation and analysis of the statistical summaries presented.

Cancer Mortality, Ontario, 1921-1947

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COMPARISON OF SEX TRENDS AND SIGNIFICANCE

THE death rates charged to "Cancer and Other Malignant Tumours" by age and sex in Ontario, 1921-1947*, are shown in outline in the accompanying graph. The medical profession understand well the weaknesses of the primary data, death certifications, before passing through the book-keeping mills and some of the weaknesses of the data thereafter; they are many. Suffice it to repeat here that breast cancer is the only major cancer that can be read in the records even now with any confidence at all. The data of other major cancers have been, and still are, seriously subject to changes in diagnosis, certification and book-keeping. The changes are, no doubt, mainly changes of site and specificity within the cancer group, but they may not be so exclusively; they may involve accessions from or rejections to categories outside the group. Even the rates for the group as a whole, therefore, have some uncertainty; comparisons of them, in time or place, must be very guarded.

INDICATIONS IN THE RATES

It is at once apparent on inspection of the graph that there has not been any sustained decline in recorded cancer mortality in any age group in either sex over this period. In the 40-49, 50-59, 60-69 age groups the rates for the females hold practically level throughout the experience. Representing considerably more than half of all female cancer mortality, this is a strong feature, perhaps the strongest feature, in the whole graph. It is to be particularly noted that the level of these lines preceded and was fairly maintained throughout the great surge of activity in cancer, of the female especially, that has marked the period since the early 1930's—the nation-wide collection for the King George V Silver Jubilee Cancer Fund with its attendant publicity, the publication and distribution of a volume on cancer for the medical profession, the inauguration and progressive development of subsidized cancer clinics throughout the Province, the intensification of publicity for the public and the profession stressing female cancer particularly and urging early diagnosis and treatment, the formation of women's groups to hear, see and

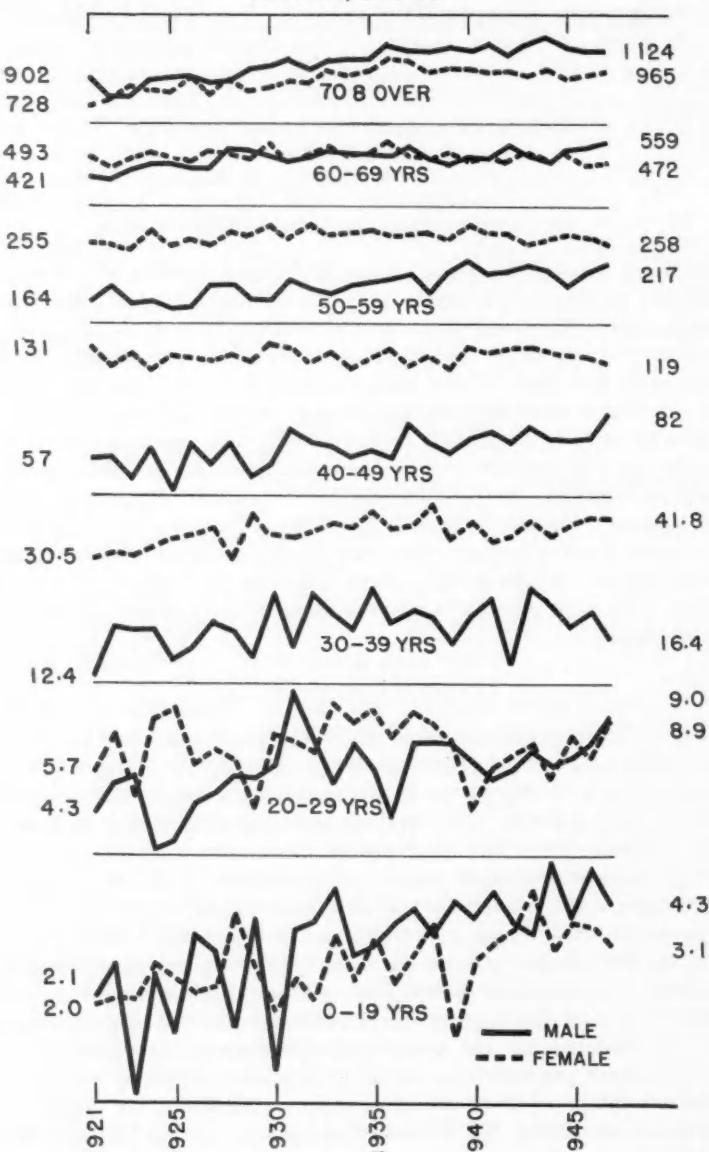
*The data for 1947 were kindly provided by the Dominion Bureau of Statistics in advance of printing.

CANCER AND OTHER MALIGNANT TUMOURS

MORTALITY RATES BY SEX AND AGE

(per 100,000)

ONTARIO, 1921-1947



Lines transposed from proportional paper.

talk about cancer, etc.—all culminating, it is thought*, in an increased and earlier attendance, of women especially, for examination and treatment at public and private clinics; so, too, it preceded and was maintained throughout reputed improvements** in diagnostic and therapeutic methods of the past two decades. Other lines on the graph appear to rise for a time and then to hold near the high point for the balance of the experience. Some lines indicate an increase continuing throughout the experience. The male rates, in general, show increases. In old age both sexes show more increase; as, in both sexes and *to an equal degree*, the records for this period show a shift away from the senility classification to more specific diagnoses, this excess of increase can be reasonably attributed to progressively greater precision in diagnosis, certification and book-keeping of the deaths in older age. In young life, the rates are based on very small numbers and are thus erratic; representing conditions which are not altogether homogeneous with those of the other rates, they are presented merely to complete the picture. As the paper trends, or changes in trend in any age group, or differences between trends in different age groups are not clearly defined, any attempt at more precise identification of these paper features would be both arguable and futile.

However, a closer examination of the relationship of the female and male rates over these years might be profitable; it could give material help in interpreting the recorded rates and in assessing their relationship to reality.

EARLY TREATMENT, ACCESSIBILITY AND CURE

It is generally claimed that early treatment greatly favours cure of cancer. So, the greater increase in female attendance for examination, as noted, should, in itself, give greater acceleration of treatment in the female and consequently a greater reduction in her cancer mortality. Accessibility of the primary lesion is one of the greatest factors in facilitating and expediting diagnosis and thus in accelerating and permitting most extensive treatment. For this factor, fortunately, some better numerical comparison is possible. Only five to ten per cent, varying in different age groups, of cancer mortality in the male is contributed by accessible sites (skin, oral cavity, pharynx), while thirty to fifty per cent of cancer mortality in the female is contributed

*In a previous note on cancer of the breast, the degree of increase in examinations and of acceleration of treatment in the past twenty years was discussed in some detail and it was considered that, in spite of "staging" figures of very questionable validity or comparability to the contrary, the evidence, in general, fully warranted the conclusion that women had responded remarkably well to the appeals for frequent examination (there are today 1,000 women *on the waiting list* for examination at one clinic), and that, consequently, there had been in them a marked increase in examinations and acceleration in treatment.

**These included, for diagnosis, the progressive development and wider use of X-ray, of pathological laboratory services and of the cytological film technique applicable particularly to the female genital tract; and, for treatment, further development and wider use of radium and other radiation, applicable particularly, but not exclusively, to cancer of the female genital tract. Regarding the cytological film technique, it is difficult to believe that amateurs or technicians with limited experience and examining a few loose cells, notoriously subject to physiological change, can do what professional pathologists with a life-time of experience and examining a multitude of cells set in their actual relationship to normal tissue cannot do; i.e., differentiate metastasizing from non-metastasizing tumours. About thirty years ago there was a claim and a challenge to pathologists to diagnose cancer from one cell; neither the idea nor the procedure survived for long. Its resurrection in a slightly altered form has received a wider reception—attributable possibly to the "agitation of the wits" which accompanies and follows war.

by sites which are today considered accessible for diagnosis and treatment, breast and genital organs each contributing about twenty per cent; female cancer mortality should, on this account, show a greater acceleration in treatment and thus a greater reduction in mortality than the male in the past fifteen or twenty years. Further, as some of the reputed improvements in diagnostic and therapeutic techniques of this period have been, as already noted, particularly applicable to a large part of female lethal cancer, these improvements should favour the reduction of female cancer mortality more than the male. With the combination of these factors—greater increase in examinations, much greater degree of accessibility and reputed improvements in diagnostic and therapeutic techniques especially applicable to the female—female cancer mortality as a whole should have shown, if any or all of these factors were effectual, a greater reduction than the male in this period. Female cancer mortality should have fallen away from its previous position relative to the male mortality.

The recorded rates do show some change in the relative position of male and female mortality. Instead of maintaining parallelism (as they should if both sexes profited equally by advances), the male rates are now closer to or farther away from the female rates than they were at the beginning of the period. As noted previously, the departure from parallelism is due, in general, to an increase in the male rates with the female rates tending more to hold about their earlier levels. It is held by some, however, that the female rates would have increased, actually or artificially, along with the male rates and would thus have held parallel to them had it not been for the more advantageous position of the female in regard to the factors mentioned. This interpretation, however, needs closer examination. In the age group of 40-59, accessible cancer provides about fifty per cent of cancer mortality in the female and only about five per cent in the male. In the 70 and over age group, accessible cancer provides about thirty per cent in the female and about ten per cent in the male. If accessibility, with consequent earlier treatment, were a governing factor, therefore, other things being equal, the departure from parallelism should be much greater in the 40-59 age group than in the 70 and over age group. Further, in the subsidized clinics, in the 40-59 age groups, new female cases treated vastly exceeded male (800 : 448); in the 70 and over age group, males far exceeded females (472 : 376). While such clinic cases may be not entirely representative of all, it is thought that it probably provides a fair index of the sex ratio receiving treatment under all auspices. Although the female cancer deaths in the 40-59 age group exceed the male (thus explaining some of the excess of females treated), the difference is not nearly as great as in numbers treated. So, too, although in the 70 and over group male deaths exceed female, the difference is not nearly as great as the difference in numbers treated. The fact, then, that the departure from parallelism in the 70 and over age group is about the same proportion as in the 40-59 and other age groups, argues strongly against, if it does not entirely invalidate, the interpretation that the departure is the result of earlier or special treatment facilitated by greater accessibility or otherwise of female cancer. Some explanation more compatible with the whole picture is therefore required.

In this regard it must be remembered that, in the greater non-accessibility of male cancer, the progressively wider and more advanced use of X-ray and of pathological laboratory services since the early 1920's has had, and undoubtedly still has, a greater field for operation than in the female. It is quite understandable that such advances would affect final diagnosis in the male to a greater extent than in the female. Thus, some, a large part, or perhaps all, of the generally greater increase in the recorded male rates may be, with reason, attributed to this factor. It is worth noting, too, that the recorded increase in cancer of the pulmonary system accounts for one-quarter to one-half, in different age groups, of the increases in the male cancer mortality, whereas there is practically no increase in this category in the female. To what extent this increase in pulmonary cancer mortality in the male represents an inclusion from without the cancer group, or a shift within the cancer group, or an actual increase in pulmonary cancer itself, it is quite impossible to say; if it is a real increase in this type of cancer (a highly controversial question), then a very considerable part of the increase in the male cancer mortality is accounted for by this alone.

With the excess of increase in old age *in both sexes* reasonably attributable to greater precision in diagnosis, certification and book-keeping of the deaths in old age; with the general increase in the male rates reasonably attributable to greater improvements in *final* diagnosis and possibly, in part, to some actual increase in pulmonary cancer in the male; with the changes in the position of the female rates relative to the male rates found not to be satisfactorily attributable to earlier or better treatment, through greater accessibility or otherwise, of female cancer, the most reasonable interpretation of the recorded rates, as shown, would seem to be that the lines with the least defect and artifact, best reflecting reality, and having the greatest degree of comparability throughout the period are those of the female rates in the 40-49, 50-59 and 60-69 age groups. In spite of all the weaknesses of the individual constituent data of these lines, the maintenance of an approximate level for such a large and important part of cancer mortality is in itself substantial evidence that there has been no material change in the cancer mortality problem in these, or by implication, in other age groups throughout this period. Reservations must, of course, be made regarding the controversial increase in pulmonary cancer in the male. With the same reservations, the variations from a level in these or other lines appear fairly attributable to changes in diagnosis, certification and book-keeping and to chance.

The lack of any decline in total cancer mortality in any age group in either sex thus conforms closely with the lack of any decline in breast cancer mortality over the past twenty or twenty-five years. It indicates, with but little if any reservations, the failure of early treatment to prevent death. This failure of early treatment, in cancer as a whole, thus supports and broadens the hypothesis drawn previously regarding breast cancer; viz., that dissemination of metastases to remote sites occurs very early, possibly before any lesion becomes manifest and probably before any tissue reaction might inhibit spread—and, therefore, before treatment of a primary lesion, from a practical standpoint, could do much to limit spread.

The experience in Ontario thus clashes with two-thirds of breast cancer cases and a similar proportion of cervical and of uterine cancer cases being classified as "treatable for cure" in the subsidized cancer clinics in 1947. It is quite incompatible with any optimistic interpretation of the statement that "with our present methods of diagnosis and treatment, it is possible to cure probably not more than half of all cancer."(4) It invalidates the contention, reasonable enough though it seemed twenty-five years ago, that early and extensive treatment, facilitated by accessibility or otherwise, greatly favours the results of treatment *as far as preventing death is concerned.*

It must be clearly emphasized here that these data are not a source of information regarding *postponement* of death in contradistinction to *prevention* of death. Evidence regarding postponement must come from other sources, and other sources undoubtedly provide conclusive evidence that treatment of some cancers materially postpones death. This is true of those cancers that produce a fatal outcome through extension of the primary lesion before widespread metastases appear to exert much influence; for example, cancers of the lower bowel, of the uterus and bladder, and, too, the few lethal cancers of the skin may, and do, cause death by local extension long before widespread metastases become manifest. Adequate treatment of such cancers undoubtedly prolongs life until the development of metastases already spread or recurrence at the primary site causes a fatal outcome. For that and for other reasons the failure of early treatment to prevent death should not call for any reduction or relaxation of treatment whatever. Other objectives, including postponement of death in certain cancers and relief in many, not only justify but demand all treatment as early and as complete as possible. The failure emphasizes the need for study of cancer in all its aspects.

SUMMARY

The death rates from cancer in Ontario, 1921-1947, show no suggestion of any sustained decline in any age group in either sex.

Cancer mortality in the female in the 40-69 age group, making well over half of all female cancer mortality, has maintained an approximate level throughout the experience. Other rates show some upward trend. Old age shows increases in the rates in both sexes due to greater precision in diagnosis, certification and book-keeping of deaths in old age. In general, the male rates tend to increase while the female rates tend more to hold near their earlier levels.

As early treatment is generally held to favour cure and as accessibility greatly favours early treatment and more complete treatment, the group showing the greatest proportion of lethal cancer accessible should show greater response to, i.e., greater reduction in mortality from, increased examinations.

As a much larger proportion of female lethal cancer than male is accessible and as female cases treated at cancer clinics vastly exceeded male cases in those age groups in which accessibility in the female is most preponderant, it would be anticipated that female cancer mortality, as a whole, would thus have fallen away from its earlier position in relation to the male mortality—

if early treatment, facilitated by accessibility or otherwise, were a greatly important factor in cure.

There is some departure from parallelism between the rates of the two sexes. However, the fact that the departure is as great in old age, where accessibility in female and male is about 30 to 10 and male cases treated at clinics far exceeded the female, as it is in the 40-59 age group, where the accessibility ratio is about 50 to 5 and where female cases treated far exceeded the male, argues strongly against earlier treatment, facilitated by accessibility or otherwise, being of much importance in determining the final outcome of cancer.

Further, it is thought that the departure from parallelism can be reasonably attributed to the development and wider use of X-ray and of pathological laboratory services over the past twenty-five years having had greater effect in final diagnosis in the greater non-accessibility of lethal cancer in the male than in the female—hence the increase in the recorded male rates.

The recorded experience in Ontario, therefore, weighed with caution, clashes with and invalidates the claim that much cancer can be cured if treated early by methods available today. It supports and enlarges the hypothesis drawn in regard to the failure of early treatment to decrease breast cancer mortality; viz., that remote dissemination of metastases occurs very early, possibly before the primary lesion becomes manifest and probably before any tissue reaction might inhibit it.

It is emphasized that evidence regarding postponement of death in contradistinction to prevention of death must be sought in other data than vital statistics. Other data show indubitably that death can be postponed where it cannot be prevented in cancers which terminate fatally through local extension before the development of metastases even becomes evident. These cancers, for example, of lower bowel, uterus and bladder, and the few lethal cancers of the skin, undoubtedly can be treated with local success and with very material postponement of death. For that and other reasons recognition of the general failure to cure (prevent death) should not interfere in any way with treatment. It should emphasize the need for study of cancer in all its aspects.

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The Connaught Medical Research Laboratories during the Second World War, 1939-1945

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THE Connaught Medical Research Laboratories, University of Toronto, were established for the advancement of preventive medicine and public health through research and through the preparation of biological products essential in the prevention and treatment of certain diseases. The Laboratories render a medical public service to all parts of Canada and, to an extent, to countries abroad. Their work was initiated and developed by the late Dr. J. G. FitzGerald, the first Director of the Laboratories, who, in 1914, undertook the preparation of diphtheria antitoxin in the Department of Hygiene, University of Toronto, in an effort to facilitate reduction in the toll of deaths from diphtheria in Canada. At the same time he conducted investigations into this and other diseases. These investigations were the beginning of researches in preventive medicine which have kept pace with the growth of the Connaught Medical Research Laboratories—more than sixty research studies being in progress in the Laboratories to-day.

Within a few months of the commencement of the work of the Laboratories, the outbreak of the First World War occurred. Soon the problem of supplies of anti-tetanus serum for the prevention of lockjaw among the wounded became acute, and early in 1915 the Laboratories undertook to prepare this antitoxic serum. Funds to facilitate this particular undertaking were provided by the Canadian government, and keen interest in the Laboratories as a national service organization quickly developed. In consequence Dr. Robert D. Defries became associated with Dr. FitzGerald in the Laboratories; and the late Colonel Sir Albert Gooderham purchased the farm property which is now part of the Dufferin Division of the Laboratories. There Colonel Gooderham erected a laboratory building, stables and superintendent's residence, and then donated the whole property to the University for the use of the Laboratories. Thus became possible the preparation and supply by the Laboratories of all the tetanus antitoxin required for the Canadian forces in the First World War, together with large amounts of other biological products including anti-meningococcus serum and smallpox vaccine.

This experience stood the Laboratories in good stead when the Second World War broke out and brought heavy demands for many of the products regularly prepared by the Laboratories. On this account preparations such as smallpox vaccine, typhoid-paratyphoid vaccine, and diphtheria toxoid were

produced in large quantities for the armed services. There was also intensive activity in the development of new products such as typhus vaccine, penicillin, and dried blood serum, as well as in the modification of existing processes and facilities to permit increased production of established preparations. The extent of such activities may be gauged from the fact that the number of persons employed in the Laboratories rose from 252 to approximately 900 between the commencement and the end of the war. In addition 91 employees went on active service, of whom two, Mr. John Richards and Mr. Gordon A. Wilson, gave their lives in the service of their country. Of the senior research and administrative staff of the Laboratories, four—Dr. M. H. Brown, Mr. F. Lorne Hutchison, Dr. D. L. MacLean, and Dr. N. E. McKinnon—were privileged to make notable contributions to the war effort, first in the wartime work of the Laboratories and later in active service with the Canadian Army or the Royal Canadian Air Force.

Typhus Vaccine

Typhus fever is caused by a member of a group of virus-like organisms called rickettsiae in honour of Dr. H. T. Ricketts, an American, who died in Mexico while studying the disease. When war broke out in 1939, no vaccine for general immunization of troops against this disease was available and the only typhus counter-measure was delousing. When the war ended, this situation was completely changed. The vaccine problem had been solved and the production of typhus vaccine in Canada and the U.S.A. was sufficient to meet all needs. Further, the value of D.D.T. in preventing the transmission of typhus had been established. These two weapons, typhus vaccine to immunize the individual, and D.D.T. to eradicate the vector, supplement each other.

In regard to immunization, there was evidence that a vaccine consisting of killed rickettsiae would protect persons against typhus fever. The main problem was to find a method of growing rickettsiae of the epidemic variety of the disease on a sufficiently large scale—a scale permitting the wholesale inoculation of fighting troops with vaccine. In 1938 Dr. Herald R. Cox, of the United States Public Health Service, had shown that rickettsiae of the murine type of typhus fever could be readily grown in fertile, developing hen eggs if inoculated into the yolk sac. Although relatively good growths of these rickettsiae could be obtained without difficulty, Cox had initially to persevere with the epidemic typhus strain for six months before he obtained sufficiently good cultures to show the organisms under the microscope. Later, much better but somewhat irregular results were obtained. Early in 1940 Zinsser, Plotz and Enders, working in the Harvard School of Public Health, developed a method of growing the rickettsiae of epidemic typhus on chick-embryo tissue kept alive on a solid nutrient medium in flasks, and they reported their belief that considerable quantities of vaccine might be produced in this way.

It was felt at this time by the Connaught Medical Research Laboratories that an endeavour should be made to develop the production of a typhus vaccine in Canada. Dr. James Craigie undertook this work in the Labora-

tories and the National Research Council of Canada made a grant in support. Dr. Craigie then visited and worked in Professor Zinsser's laboratory in Boston, and on his return in July, 1940, work was commenced. The first five months were occupied in a comparative study of the Cox and Zinsser methods of growing typhus rickettsiae. By the end of 1940 the method of Cox seemed the more promising. Two problems, however, had to be solved. Much richer cultures were required, and some adequate method of separating the organisms from yolk and yolk-sac tissue had to be found. Increasingly richer cultures were obtained by utilizing information gained in the course of a detailed study of the growth habits of the rickettsiae. The problem of purification was solved by taking advantage of a property of the yolk present in the crude vaccine preparation. Egg yolk contains substances which aid in forming emulsions. Ether, which is relatively insoluble in water, can be emulsified in water to which a little egg-yolk has been added. The suspended globules of ether attract yolk granules and tissue fragments to their surface, but rickettsiae and other micro-organisms are repelled from this surface. This, in brief, is the principle on which the method developed by Dr. Craigie was based.

The production of typhus vaccine on a large scale was organized in two stages—culture and processing. The first stage was carried on under the direction of Dr. Laurella McClelland at the Dufferin Division of the Laboratories and commenced in August 1942. Most valuable aid was given by Mr. M. D. Orr in the organization of this work. At the peak of production 2,000 fertile eggs were inoculated each working day. The inoculated eggs were incubated for eight to ten days until the developing embryos died of typhus. The yolk sacs were removed and reduced to a fine state of division by grinding in saline; and the living rickettsiae were then inactivated by formalin. An efficient system of purifying the vaccine by the ether method was organized and supervised by Dr. Raymond Parker in the College Division of the Laboratories. After purification the vaccine was refrigerated in bulk pending the necessary sterility and potency tests.

Preparation of typhus vaccine involved translating results of research work into terms of mass production. Dr. Dennis W. Watson, previously of the University of Wisconsin, was a member of the typhus research group from September 1942 to December 1943 and made a number of valuable studies, in co-operation with the other members, which resulted in increasing greatly the extent of the yolk-sac infection and the potency of the final vaccines.

A preparation of killed micro-organisms does not necessarily constitute an effective vaccine against the corresponding disease. The substances which stimulate immunity may be destroyed or lost in preparing the vaccine. The choice and design of the potency test for typhus vaccine was a most important research problem. The development of the test used in Toronto required a great deal of exacting work in which Miss E. M. Clark and Dr. John Crawley most ably assisted. The test followed the development of special methods and differed from that used elsewhere.

By the summer of 1942 the main and essential steps in the mass production

of typhus vaccine had been determined. Certain modifications were made during the ensuing year as experience increased, but thereafter the procedures remained substantially unaltered. From January 1943 the production of vaccine began to rise steadily and continued rising until the summer of 1945. During the peak of production one million doses of vaccine were being made each month. In all, more than ten million doses were supplied.

In common with typhus vaccine produced in the U.S.A., the vaccine produced by the Connaught Medical Research Laboratories arose out of Cox's discovery in 1938 that rickettsiae could be grown in the yolk sac of living embryonated eggs. Although the rickettsiae for the preparation of the vaccine were obtained by Cox's method, i.e., from yolk-sac cultures, all the details of the vaccine production in Toronto were based on independent research carried out by Dr. Craigie and his associates with the aid of grants from the National Research Council of Canada.

Tetanus Toxoid and "TABT"

In the First World War the only specific means for preventing lockjaw among the wounded was the administration of tetanus antitoxin. The protection afforded by this serum was of short duration. Between the two world wars, a great advance was made in the prevention of lockjaw through the use of tetanus toxoid, a preparation which was introduced by Ramon, working in the Pasteur Institute, Paris. In 1923, Ramon had prepared diphtheria toxoid and subsequently had demonstrated its value in the prevention of diphtheria. His discovery of diphtheria toxoid and his later preparation of tetanus toxoid constitute two of the most important contributions ever made in preventive medicine. In the Connaught Medical Research Laboratories, diphtheria toxoid was prepared by Dr. P. J. Moloney within a few months of the publication of Ramon's results; and later, following Ramon's successful preparation of tetanus toxoid, work with this preparation was undertaken in these Laboratories by Dr. P. A. T. Sneath and continued by Mr. M. D. Orr. With this background of experience it was possible for the Laboratories to have tetanus toxoid available in quantity for the use of the armed forces early in November 1939. Experience in Great Britain, Canada, and elsewhere showed that although tetanus toxoid was markedly effective, undesirable reactions occasionally occurred following administration of the product. On this account intensive work was undertaken in the Connaught Medical Research Laboratories by Dr. Edith Taylor, who succeeded in developing an improved method for the production of tetanus toxin from which tetanus toxoid is prepared. This toxin surpassed in potency that prepared by other methods, and was of such a character that the tetanus toxoid prepared from it was free from undesirable effects.

Early in 1940 Canadian military authorities were anxious to reduce, if possible, the number of injections to be given to service personnel. Such a reduction had been achieved in the French Army, and combined vaccines, including a combination of tetanus toxoid with typhoid-paratyphoid vaccines, were in use. This experience, coupled with recommendations from the Connaught Medical Research Laboratories, led to trial experiments designed

by Dr. D. T. Fraser and conducted by the Canadian Army in co-operation with the Laboratories. As a result, a combined preparation of typhoid vaccine, paratyphoid (A & B) vaccine and tetanus toxoid—"TABT"—was prepared in the Laboratories and used by the Canadian armed forces.

During the early part of the war the method commonly in use for the testing of tetanus toxoid consisted of animal tests and laboratory flocculation tests. The animal tests were time-consuming, and the other tests were difficult to interpret, largely because of the fact that flocculation occurred in several zones. The matter of process improvements was therefore a serious problem since new preparations could not be assayed quickly with certainty. Dr. Moloney, appreciating this problem from his extensive studies with diphtheria toxoid, investigated the subject. As a result of his research, methods were developed for the preparation of tetanus antitoxin and toxoid which flocculated in single, specific zones. Using these means it became a matter of hours rather than of days to evaluate material, and thus increased production was effected.

Supervision of the production of tetanus toxoid at the Dufferin Division was one of the many responsibilities of Mr. Orr and later of Miss M. Lang. Efficient management of this work and application of the results of intensive research made possible the preparation of tetanus toxoid of remarkably high potency.

Human Blood Serum

The Canadian project for the preparation of dried blood serum for the treatment of war casualties was initiated by Professor C. H. Best, then Head of the Department of Physiological Hygiene, School of Hygiene, University of Toronto, and also at that time an Associate Director of the Connaught Laboratories. His early work in this project had the support of the National Research Council, the Department of National Defence and The Canadian Red Cross Society, and was conducted in the Department of Physiological Hygiene, with the assistance of many members of his staff including Dr. D. Y. Solandt, Dr. Jessie Ridout, Dr. R. E. Haist, Dr. A. L. Chute, Dr. J. W. Magladery, Dr. E. Fidlar and Mr. Campbell Cowan.

Blood donors were first recruited in September 1939 from members of the staffs of the School of Hygiene and the Connaught Medical Research Laboratories, and later from students at the University. An ordinary laboratory bench served in turn as a table for the assembling of equipment, a bed for blood donors, and a work bench for the processing of blood. Of necessity, all these operations were conducted in one room in the School of Hygiene building. The entire staff was composed of two or three persons who turned from one operation to another as the need arose. After blood was drawn it was typed and allowed to clot. From the clotted blood the serum was separated and the various sera were combined in groups, in accordance with their particular blood types. Subject to satisfactory sterility tests, this material was filled into 250-cc. bottles of a kind readily available. The freezing and drying operations were carried on in a small section of the School of Hygiene building, where space was provided for a freezing tray containing

alcohol and solid carbon dioxide, and for a pump and drying cabinet purchased with funds provided by the Department of National Defence. The University also made available a room in which a number of volunteer workers assisted with the project. Later, as the need of suitable accommodation for drawing blood became more pressing, facilities were made available at the former Grace Hospital near the University. Subsequently, improved facilities for a Toronto blood-donor clinic were provided by The Canadian Red Cross Society at 410 Sherbourne Street.

As the value of dried serum became evident, the work quickly expanded to the limit of the facilities of the Department of Physiological Hygiene. The success of the project made it necessary to consider re-organization in order to provide sufficient laboratory accommodation and funds. Accordingly, in October 1940, representatives of the Department of National Defence attended a meeting called by the late Sir Frederick Grant Banting, as Chairman of the National Research Council's Associate Committee on Medical Research, and by Dr. R. E. Wodehouse, then Deputy Minister of Pensions and National Health, for the purpose of co-ordinating the various groups interested in the use of human serum and of helping in the formation of an organization to ensure the production of an adequate supply. In consequence, from January 1, 1941, the project was undertaken and carried forward by the Connaught Medical Research Laboratories. Dr. A. M. Fisher directed this undertaking, and associated with him was Dr. A. F. Charles. The arrangements made with the Dominion Government through the Department of Pensions and National Health provided that the Government would reimburse the Laboratories for operational and maintenance costs directly involved in the conduct of the blood-serum work. The Laboratories undertook to contribute directorial and managerial costs, ordinary administration and overhead costs, and other indirect costs—a commitment which involved an expenditure exceeding \$142,000. The Canadian Red Cross Society assumed the responsibility for collection of the very large quantities of normal human blood and serum which were required.

In the early days of this arrangement, clotted bloods from widely separated points in Canada were forwarded to the Connaught Medical Research Laboratories for removal of sera. As the volume of work increased, The Canadian Red Cross Society provided laboratory facilities in Halifax, Fredericton, Winnipeg, Saskatoon, Edmonton and Vancouver for preliminary separation of serum. In most instances these laboratories were organized and operated with the assistance of the universities in individual provinces. From these laboratories, sera were forwarded to the University of Toronto for completion of processing and for drying. During 1944, the last complete year in which the wartime blood-donor service was in operation, the various clinics, staffed by voluntary physicians, nurses and other interested personnel, collected 868,000 blood donations.

Operations concerned with the processing and drying of serum were originally conducted in two rooms of the School of Hygiene building. The original processing equipment consisted of one vacuum pump and a drying cabinet. Early in 1941 it was necessary to enlarge existing facilities by the

purchase of three additional pumps. This was made possible by the Dominion Government through the Department of Pensions and National Health. Space for the greatly enlarged installation was provided by the Connaught Medical Research Laboratories at their Dufferin Division located a few miles north of Toronto. To accommodate the processing of the large quantities of blood being received, some peacetime operations of the Laboratories were abandoned or crowded together, and thus room was found for the preparation of blood sera and the sterilization of equipment.

During the year 1941, approximately 36,000 donations of blood and serum were received; by March 1942, the volume had increased to over 11,000 donations monthly, and further increases were contemplated. It was again necessary to increase facilities for the processing and drying of blood serum. The additional space that could be made available in the School of Hygiene building by the School and the Connaught Medical Research Laboratories, including the use of the large corridors of the building, amounted to only 3,200 square feet and was inadequate. Moreover, additional processing equipment could not be obtained for many months. It became imperative therefore to make greater use of existing space and facilities by the organization of a staff for night work. This was a major contribution to the success of the project.

At the Dufferin Division the maximum capacity for drying serum was two thousand 250-cc. bottles per week. To increase this a temporary building had to be erected in the courtyard of the School of Hygiene building, and equipment having a weekly capacity of approximately twenty-five hundred 400-cc. bottles of serum was installed there. The boiler installation for the operation of this equipment necessitated other building re-arrangements which were undertaken by the Connaught Medical Research Laboratories and made possible the completion of plans for the new serum building. By the summer of 1942, the new plant was fully engaged in the production of dried serum, with the result that in it and in the plant at the Dufferin Division there was in operation, twenty-four hours daily each day of the week, drying equipment operated by steam ejectors and four vacuum pumps, with a total weekly capacity of approximately 5,000 bottles of dried human blood serum.

By October of 1943, donations of blood and serum forwarded to the Laboratories amounted to over 57,000 monthly—an increase of 21,000 over the donations in March of the same year. It again became necessary to seek additional space, for the combined day and night staff now exceeded 140 persons. In these circumstances, and having in mind the preparation of penicillin for the armed services, the Connaught Medical Research Laboratories arranged for the purchase of the former Knox College building, on Spadina Crescent, for the purpose of two of its wartime projects—the initial steps in processing of blood serum and the preparation of penicillin. This building, which had been first a theological college and later in succession a hospital, a provincial government building, and a military headquarters, was placed in good order and, with the aid of the Dominion Government, properly equipped as a laboratory unit for the processing of more than 25,000 samples of blood weekly. Some of the operations in this work were transferred to

the Spadina Division, as the new unit is now called, in January 1944, and in April a two-day holiday in most Ontario blood-donor clinics permitted the removal of other equipment from the School of Hygiene building and its installation in the newly constructed quarters. Operations then continued on a larger scale and with increased efficiency, without a break except for Christmas Day 1944, until the cessation of hostilities.

The services provided by the Dominion Government through the co-operative arrangement with the Connaught Medical Research Laboratories extended beyond the supply of dried serum. To meet the great need for blood-typing sera in military establishments, large amounts of these sera were prepared in the Laboratories from the blood of voluntary donors. The Laboratories also provided training for laboratory personnel of the Royal Canadian Air Force in the technique of blood typing.

Although most shipments of dried serum were forwarded to England and were there packed with bottles of water necessary for dissolving the dried serum prior to use, there were several occasions on which the project of the Connaught Medical Research Laboratories was extended to include the supply of sterile pyrogen-free distilled water. Also, for the intravenous administration of any fluid appropriate apparatus consisting of hypodermic needles, drop counter, rubber tubing, etc., is necessary. In order that complete equipment might be provided, the Laboratories were asked to procure component parts which were adaptable to British or Canadian Army practice and to assemble, sterilize and package the equipment for use in the field. Thus the project grew from one having as its object the preparation of dried blood serum to an undertaking for the provision of several of the essentials in transfusion therapy. During the course of the project there was processed in the Laboratories the serum from over two million donations of blood. Shipments amounted to more than 436,000 bottles of serum, 51,000 administration sets, 34,000 bottles of pyrogen-free sterile water and 23,500 vials of typing serum. When the war ended, more than 500,000 bottles of dried serum had been processed, representing nearly $2\frac{1}{4}$ million donations of blood.

Gas Gangrene Antitoxins

About a dozen types of *clostridia* are known to cause disease in man. These organisms are widely distributed in nature because they are normal inhabitants of the intestinal tract of animals. Since under conditions unsuitable for growth these bacteria may pass into a dormant or spore stage, they may remain in the soil for long periods of time or be blown about in dust. While infections with *clostridia* are recorded from time to time, their occurrence is normally infrequent. In time of war, however, the incidence of such infections may be high and the prognosis for infected persons is grave. The most frequently infecting types of *clostridia*, as demonstrated in the Second World War, are *Cl. perfringens*, *oedematiens* and *vibron septique*.

When war broke out in 1939, the Connaught Medical Research Laboratories, reviewing fields in which their functions might be of service, decided to prepare gas-gangrene antitoxins. It was possible to proceed with this work without delay because for some years, under Dr. D. T. Fraser's guidance, Dr. Helen Plummer had been studying the growth and toxin-producing powers

of *clostridia*. During the fall of 1940 and the spring of 1941, small quantities of *perfringens*, *oedematiens* and *vibron septique* antitoxins were made. At that time, however, in the absence of large-scale military operations, and perhaps also because of lack of favourable experience in the 1914-1918 war, there was little interest in gas-gangrene antitoxins. Hence, after showing the practicability of regular production of these antitoxins, the Laboratories discontinued their production.

In May 1943, the Department of Munitions and Supply of the Dominion Government asked the Connaught Medical Research Laboratories to produce gas-gangrene antitoxins. This unexpected interest arose from the fact that during the campaign in North Africa in 1942, the British Army had found that gas-gangrene infections could be effectively treated by a combination of surgery with drugs of the sulphonamide group and antitoxin. The request was for 150,000 doses of a mixed antitoxin, each dose containing 9,000 units of *perfringens*, 9,000 units of *oedematiens*, and 4,500 units of *vibron septique* in a volume not over 10 cc. Delivery of this amount was to commence as soon as possible and was to be completed within eighteen months from commencement of the undertaking.

Calculations based on experience gained by the Laboratories in 1940-1941 indicated that at least 300 horses would be required for the preparation of the quantity of antitoxin desired. Since the Laboratories had stabling for only about 100 horses, it was necessary to provide additional accommodation quickly. Accordingly, at the Dufferin Division, construction was begun on six wooden stables, each accommodating fifty horses, a feed storage shed, an isolation stable, an operating building and a greatly enlarged water supply. Facilities for purification and concentration were increased approximately twelvefold by an addition to the Concentration Building. Suitable methods of large-scale purification and concentration were developed and conducted there under the direction of Dr. R. P. C. French, while Dr. Edith Taylor undertook the production of the essential toxins, in which work she was eminently successful.

The first horses were housed in the new stables in August 1943. The first shipment of antitoxin was made in October 1943, this being possible because there were on hand some of the antitoxins produced in 1940-1941. From that date onwards, the volume of shipments increased so that by August 1944 it appeared certain that the objective of supplying 150,000 doses would be achieved by the end of December. In August, however, a request came from the Department of Munitions and Supply for the Laboratories to produce another 150,000 doses, to be delivered not later than July 1945. It was realized from experience already gained that if this new task was to be accomplished, still more horses had to be obtained at once. This meant, of course, that additional stable space had to be built or found. Towards meeting this need the Hamilton Jockey Club generously agreed to rent their stables, and with this and other help a total of over 1,000 horses was maintained by Dr. E. G. Kerslake and immunized to make possible the required volume of antitoxin. In all this work Mr. M. D. Orr and Dr. P. J. Moloney made most valuable contributions.

It was a matter of satisfaction that gas-gangrene antitoxins were supplied to the Government on a basis which, including capital and operating costs, was less than 50 per cent of the contract price which prevailed at the time for supplies obtained from other sources by allied governments.

Influenza Vaccine

Influenza virus was first isolated by intra-nasal instillation into ferrets of throat washings from a patient, the virus being recovered from the turbinates of the ferret. From the ferret, the virus was adapted to infect mice, in which it produced a fatal pneumonia, and from mouse lung it was adapted to proliferate in the embryonated egg. Two antigenically different strains of influenza were early identified, and designated "A" and "B". Various sub-strains of A and B have since been identified, each having some minor differences from the parent A or B, but being fundamentally related.

For several years prior to the war Dr. Ronald Hare was engaged in studies in this field and established in the Connaught Medical Research Laboratories a centre in Canada for the isolation of strains of influenza virus. Thus the Laboratories were able to extend their facilities to assist in meeting the needs of the armed services relative to control of this disease.

Two discoveries that have been of particular aid in research methods were the findings that the presence of influenza virus could be identified by its ability to agglutinate red blood cells, and that chick embryo could be used for the primary isolation of virus. It had been shown that mice became immune to otherwise fatal doses of influenza virus after inoculation subcutaneously or intraperitoneally with preparations of killed virus suspensions. This led to attempts in various laboratories to prepare vaccines for use in man. The earliest vaccines were made from influenza-infected mouse lung—obviously not an ideal preparation since there was much foreign protein and always the possibility of other virus being present. Subsequently, vaccines were prepared from chick embryo tissue and from chorio-allantoic membrane, both of which, although avoiding the source of concurrent virus contamination, had a high foreign protein content and a relatively low virus content. When allantoic fluid was found to be an excellent source of virus, it was used as an immunizing agent, and better vaccines were gradually developed by concentrating and purifying the virus from this fluid.

The Connaught Medical Research Laboratories were asked to supply vaccine containing virus strains A and B for the Canadian forces. In undertaking this work, the preparation of vaccine from chick embryos was carried on under the immediate direction of Dr. Laurella McClelland at the Dufferin Division; and the preparation of the seed virus, the testing of the vaccine and the making of pooled lots was conducted at the College Division under the direction of Dr. Hare. At the Dufferin Division, Mr. Orr was responsible for the general administration of the project.

Work was commenced in August 1944 and was completed by March 1945, during which time about thirty-six members of the laboratory staff were employed in the work. This group processed about 2,000 eggs daily, preparing approximately 30,000 doses of vaccine each month.

Cholera Vaccine and Anti-Dysentery Serum (Shiga)

In view of the desire for cholera vaccine to protect members of the armed services in the Pacific and other theatres of war, fundamental work relative to the preparation of such vaccine, particularly the development of improved methods for determining its antigenic value, was undertaken by Dr. L. E. Ranta under the direction of Dr. C. E. Dolman in the Western Division of the Laboratories at The University of British Columbia. Representative cholera strains were obtained by them, and intensive study of the antigenic value of each was made in the Division. In consequence, the Laboratories were able to supply cholera vaccine for use in the armed forces. In addition, wartime studies were carried on directed towards improving the protective value of this immunizing agent.

Dr. Leone Farrell was successful in preparing anti-dysentery serum (Shiga) of high potency, and also obtained encouraging results in efforts to prepare Shiga dysentery toxoid.

Penicillin

Penicillin was discovered in 1929 by Sir Alexander Fleming of St. Mary's Hospital, London, England. This discovery provides a good example of beneficial results which may follow from careful observation of a chance happening. Working with culture plates in his laboratory, Dr. Fleming noted that some of these showed areas of inhibition of culture growth. These areas were ones where air-borne moulds had fallen on the plates. He surmised that the mould—a *penicillium*—was producing a material which inhibited growth of bacteria. After further laboratory studies he suggested that this material—penicillin—"may be an efficient antiseptic for application to, or injection into, areas infected with penicillin-sensitive microbes". In 1932, Professor H. Raistrick and associates of the London School of Hygiene and Tropical Medicine contributed important information on yields of penicillin from selected media and also on its chemical extraction with ether. In 1940 and 1941 there appeared the results of a group of Oxford workers under Florey. Their report announced the preparation of penicillin as an impure, water-soluble, brown powder and showed that it was effective in treating patients. The work of this group successfully developed penicillin to an extent which fully justified Fleming's anticipations.

Following a visit of Dr. Florey to Canada and the U.S.A. in 1942, Dr. Philip Greer, assisted by Dr. A. Gray, undertook studies of penicillin in the Department of Pathology and Bacteriology, University of Toronto. Dr. C. C. Lucas and Dr. S. F. Macdonald of the Banting and Best Department of Medical Research of the University developed methods by which active penicillin could be extracted from crude broth and prepared in a form suitable for clinical use. Early in 1943 their work had progressed to a point where a pilot plant was considered desirable, and provision for this was made by the National Research Council.

In August 1943, the Dominion Government asked the Connaught Medical Research Laboratories to undertake the large-scale production of penicillin for the needs of the Canadian armed services. Since accommodation of

equipment necessary for this undertaking, and for concurrent requirements in the processing of blood serum, was not otherwise available within the University, the Laboratories arranged, as already mentioned, for the purchase of the former Knox College building and property on Spadina Crescent, Toronto. With financial assistance from the Dominion Government, this building was remodelled and equipment was installed so that in less than eight months from the time the task was undertaken penicillin was being produced there. As a result, it was possible to fulfil the initial large requirements of penicillin within the time limit specified by the Government. Production was maintained for the Government as long as special needs existed, and was continued as a regular undertaking of the Laboratories involving an extensive program of research.

At first, penicillin was produced by growing the penicillium mould on the surface of a suitable liquid medium in bottles resembling quart milk bottles. The bottles containing the culture were placed for approximately one week in rooms having special temperature-regulating devices enabling control of conditions to promote maximum growth. In an endeavour to meet the urgent need for penicillin, the penicillin laboratory was in operation twenty-four hours daily, and over 30,000 bottles were handled each day. Very special aseptic technique was required in preparing the mould spore suspensions, in inoculating the medium in the bottles, and in preventing contamination throughout the period of growth. All this called for specially developed methods and carefully trained operating personnel. Moreover, it was necessary to develop methods for the extraction of penicillin and for its purification, including the removal of impurities which would occasion reactions or pain in patients receiving injections of the product.

Later the "submerged-culture" process, in which deep tanks are employed, replaced the "bottle" process. Less space and labour, together with increased yields and reduced costs, were important advantages of the newer process. Intensive studies of submerged-culture methods were made by laboratories specially designated by the National Research Council of the United States, and also by several of the leading manufacturers of pharmaceuticals. Suitable mould strains for submerged growth were sought, together with determination of the necessary conditions of aeration and the best designs of tanks. The Northern Regional Research Laboratories, U.S. Department of Agriculture, selected an appropriate strain for submerged growth, and later the Carnegie Institute developed by X-ray treatment a highly successful mutant of a strain from the University of Minnesota. Then, late in 1944, plans were prepared by the Connaught Medical Research Laboratories for the production of large quantities of penicillin by the submerged-culture process. Dr. N. L. Macpherson undertook this work, and on July 1, 1945, the first tank of submerged-culture material was successfully harvested and processed. Important contributions to the successful production of penicillin were made by Mr. D. G. Dix, Dr. R. E. Carlyle, Miss H. G. M. Macmorine and Mr. A. R. Lucas.

The story of the production of penicillin in the University of Toronto is an illustration of success achieved by team-work among various departments of the University. It is gratifying that not only were very large quantities

of penicillin made available, but also an opportunity was provided for research with penicillin and with other antibiotics. The assistance of committees set up in Washington by the War Production Board, the National Research Council and the Department of Agriculture was extended to the Connaught Medical Research Laboratories. The allocation of essential supplies by the War Production Board, particularly items of equipment which were in very short supply, made possible the early commencement of the work. Representatives of the Laboratories were privileged to attend scientific discussions arranged by the various authorities in Washington associated with the development of penicillin production. Thus every assistance was given to the Laboratories in this work.

Much credit is due to Dr. Ronald Hare, Dr. N. L. Macpherson and Dr. P. H. Greey, who initially directed the large-scale production of penicillin in the Connaught Medical Research Laboratories, and to Dr. Macpherson for his subsequent development of production employing the submerged-culture method. Invaluable services in the penicillin program were given by Dr. S. F. Macdonald, Dr. C. C. Lucas and Dr. P. H. Greey in their capacities as consultants.

CONCLUSION

As is evident from the foregoing summary, much of the activity of the Connaught Medical Research Laboratories during the period 1939-1945 was directly concerned with the prevention or treatment of disease among personnel in the armed forces. But the Laboratories would have failed in their functions if they had not also continued their program of research and production in the civilian public-health field at home. As it was of national importance to prepare tetanus toxoid so it was that the production of Insulin, liver extract, heparin, diphtheria toxoid, vaccine virus and other products should be safeguarded and continued. Without the assistance and co-operation of the staff members engaged in these undertakings it would have been impossible for other members to plan and supervise the various special wartime projects of the Laboratories.

No record of the war activities of the Laboratories would be complete without acknowledgment of the counsel and assistance of Dr. Balmer Neilly, Chairman of the Connaught Committee of the Board of Governors, and of the Vice-Chairman, Mr. Frederick K. Morrow, and the other members of the Committee in coping with problems presented by the greatly increased work of the Laboratories in 1939-45.

The Types of Coli-Aerogenes Organisms Occurring in Frozen Vegetables¹

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THE coliform organisms can be practically identified by employing the "Imvic" classification of Parr (1936), which is essentially the reactions of the organisms to the indol, methyl red, Voges-Proskauer, and citrate tests. The symbols recording their reactions to these four tests are used to designate the types of coliform organisms encountered. *Escherichia coli* (++++), *Aerobacter aerogenes* (---++) and numerous intermediate types [Malcolm (1938); Parr (1938); and Stuart, Griffin and Baker 1938)] constitute the group.

The present investigation was carried out to determine which "Imvic" varieties of coliform organisms are encountered in frozen vegetables and in what proportions they occur before and after storage of these foods for a given length of time at -4°F.

METHODS

The frozen foods were prepared for sampling by blending 50-gram samples in 450 millilitres (ml.) of sterile water for 2 minutes. The resulting 1/10 dilution was used in the standard presumptive test for coliform organisms employing brilliant green bile broth. The errors encountered with this enrichment technique when ascendancy of types is being observed were fully realized. Those cultures showing gas production were plated on eosin methylene blue agar and after incubation all representative colonies were picked. The following procedure as recommended by Ruchhoft, Kallas, Chinn and Coulter (1931) for the purification of cultures was followed. After primary picking from eosin methylene blue plates, the organisms were cultured in tryptone broth for 2 to 3 hours and streaked on eosin methylene blue agar; after 20 to 24 hours' incubation, the colonies were again picked, and the procedure repeated. The resulting sub-cultures were gram-stained, and transferred into lactose broth, agar deeps and the differential media. The test for indol production was completed in 72 hours, and the methyl red and Voges-Proskauer tests in duplicate were carried out at 48 hours and 5 days. An incubation temperature of 37°C. was employed throughout.

¹Contribution No. 283, Division of Bacteriology and Dairy Research, Science Service, Department of Agriculture.

RESULTS

From 108 commercially frozen samples of vegetables and cantaloupe, 508 coliform cultures were isolated, purified and classified by the "Imvic" tests. Of these organisms, 53 per cent were found to be *Aerobacter aerogenes* (—++) and 3 per cent were the fecal *Escherichia coli* (++)—. Eight intermediate types were obtained of which the following were predominant: —++ (23 per cent), ++— (7 per cent), +—++ (6 per cent) and ++++ (3 per cent). Of the remaining four types, none exceeded 2 per cent.

After 70 of these frozen foods had been held in storage for 1 year at -4°F ., 42 of them remained coliform positive. Previous to this storage period, 233 coli-aerogenes organisms had been isolated from these 42 foods and after 1 year at -4°F ., 166 were obtained. A comparison of the types recovered before

TABLE I
THE RELATIVE NUMBERS OF "IMVIC" TYPES OF COLI-AEROGENES BACTERIA
ENCOUNTERED IN FROZEN VEGETABLES AND CANTALOUPE

Varieties encountered	Percentage types occurring in frozen foods stored at -4°F .			Percentage frozen foods containing each variety after storage at -4°F .		
	108 samples		42 samples	108 samples		42 samples
	Stored 1-3 mo.	Stored 1-3 mo.	Stored 1 yr.	Stored 1-3 mo.	Stored 1-3 mo.	Stored 1 yr.
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
— + + +	53	52	51	68	67	71
+ + - -	3	5	1	4	7	2
- + - +	23	20	14	37	33	31
+ + - +	7	9	15	16	24	26
+ - + +	6	7	5	12	14	12
+ + + +	3	4	7	5	5	14
- + - -	1	0.5	4	2	2	2
- - + -	2	0.5	0	3	2	0
- + + +	1	0.5	1	3	2	5
+ - - +	1	1	1	3	5	5
- - - +	0	0	1	0	0	5
Total number of cultures	508	233	166			

and after storage reveals a slight decrease in the relative numbers of ++— and —++ types and a slight increase in +—++, —+—, and ++++ varieties. Further comparisons revealed that, after storage, the number of frozen foods containing *Escherichia coli* had decreased while those containing the ++++ intermediate showed an increase in numbers. Table I records the data obtained from the above experiments, and shows the effect of storage on the relative numbers of coliform organisms.

There has been some emphasis placed upon the impossibility of identifying

coliform types by the macroscopic examination of colonies on eosin methylene blue agar—Parr (1933); Parr (1934); Parr (1936); and Ruchhoft, Kallas, Chinn and Coulter (1931). A brief description of the colonial appearance of the major varieties of coliform organisms encountered here will illustrate this difficulty. The —++ *Aerobacter aerogenes* colonies were found to vary from large, dark mucoid types to small, clear colonies, some of which show irridescence. On the other hand, the +--- *Escherichia coli* bacteria which usually appear as typical small, black, irridescent colonies, are occasionally mucoid with or without irridescence. The -+-+ intermediates are more inconsistent, showing small to medium sized colonies, shaded or colourless, with or without irridescence. The ++-- varieties usually appear as flat, dry-looking colonies with iridescent centres. However, raised, mucoid types appear regularly in this group also. It can therefore be concluded that colonial appearance is an unreliable indication of the types of coli-aerogenes bacteria as differentiated by the "Imvic" procedure.

SUMMARY

The "Imvic" tests have been applied to coliform organisms isolated from frozen vegetables and cantaloupe. In all, 10 varieties of the coli-aerogenes group were obtained, the majority of which were *Aerobacter aerogenes* (53 per cent) and the intermediate type -+-+ (23 per cent). It was found that after storage of frozen foods for 1 year at -4°F., little variation in proportion of types was evidenced.

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THE HALIFAX MEETING

THE thirty-seventh annual meeting of the Association, held in Halifax during the last week of June, was one of the most successful in the Association's history. The Committee on Arrangements planned wisely and effectively, and great credit is due Dr. Allan R. Morton and his associates, Dr. D. J. Mackenzie, Dr. C. B. Stewart, Dr. J. S. Robertson, Dr. J. J. MacRitchie, and Mr. E. C. Thomas. The hospitality that is so characteristic of the Maritimes was generously extended, and Halifax, observing its Bicentenary, was in a holiday mood. Every member will recall with pleasure this visit to Canada's historic Atlantic port.

One of the most pleasing features of the entertainment program was the cruise on H.M.C.S. "Haida", made possible by the Honourable the Minister of National Defence, Mr. Brooke Claxton, and the Flag Officer, Atlantic Coast, Royal Canadian Navy. Other highlights of the meeting were the garden party, at which the members were guests of the Provincial Department of Public Health; the reception given by the City of Halifax Bicentenary Committee, preceding the annual dinner; and the dinner itself, when Dr. P. S. Campbell, Deputy Minister of Health of Nova Scotia, was made an honorary life member of the Association. Dr. Leonard Miller's account of public health in Newfoundland was an informative and delightful contribution to the dinner session.

As the years pass, the annual meetings of the Association are judged by the significance of the subjects dealt with, both in papers by members and by leaders from other countries and in the discussions and plans. The program of the Halifax meeting included a number of subjects of special concern to those engaged in public health today. Many of the papers will be published in the JOURNAL.

The meeting will occupy a prominent place in the records of the Association because of the frank facing of problems relating to the value of much of the work that occupies the larger part of the time of the medical officer of health and his staff. Through the interest and financial assistance of the W. K. Kellogg Foundation, the Canadian Public Health Association

has been able to conduct an eighteen-months' study of public health services as provided locally in cities, towns, and rural areas. The study was made by Dr. J. H. Baillie and Miss Lyle Creelman, who visited at least one urban area and one rural health unit in each province to obtain the essential information. They presented their findings and recommendations to a general session presided over by Dr. J. S. Kitching, chairman of the Study Committee on Public Health Practices. The presentation of the field work team will form the basis of the Committee's final report.

One session of the meeting was devoted to consideration of the administration of a plan of national health insurance, particularly from the standpoint of provincial administration. The members of the panel consisted of Dr. M. R. Elliott, chairman, and Doctors G. F. Amyot, F. W. Jackson, A. D. Kelly, Vincent Matthews, and F. D. Mott. Two viewpoints were presented: that of the medical profession as expressed by the Canadian Medical Association, including the basic principles which were considered essential in any plan of health insurance; and that of the experienced public health administrator. The discussion was centered on the administration of health insurance within a province. The two points of view differed widely. On the one hand, the advantages of a so-called "independent commission", to assure freedom from political interference, were stressed and presented as the only type of administration that would be acceptable; and, on the other, administration by a provincial department of health was given equal stress as being practical and effective in providing for all the health needs of the people. Discussions such as this are helpful and enlightening. As a result of the discussion and the evident desire of all to work together to find a solution to what appears to be a major difficulty in the planning of the administration of health insurance in Canada, a resolution was passed asking the Executive Council of the C.P.H.A. to express to the C.M.A. their desire to study this particular problem through a joint committee which would bring forward its findings at the next annual meeting. Appreciation of this action, expressed by Dr. Kelly, Assistant Secretary of the Canadian Medical Association, was received with satisfaction by the meeting. At a time when some who are not sufficiently well informed are stating publicly that today's public health program is in conflict with private medical practice, it is heartening to have this action by the Association and to look forward to the study of this and possibly other problems by a joint committee. The Canadian Public Health Association and the Canadian Medical Association can do much to develop sound plans which may well be the basis of further developments in social security, particularly as relating to health insurance.

BOOKS

Rural Health and Medical Care. By Frederick D. Mott, M.D., and Milton I. Roemer, M.D., M.P.H. New York, Toronto and London: McGraw-Hill Book Company, 1948. 608 pp. \$7.80.

THERE WAS a real need for the presentation of the actual situation in the United States in regard to rural health and medical care. To present it properly, a vast amount of information relating to rural health problems had to be given most careful study and appropriately condensed for inclusion in this volume. To assist the reader in understanding rural health problems, the economic and historical developments had to be outlined and the social background sketched. Dr. Frederick D. Mott and Dr. Milton I. Roemer have succeeded admirably in the task which they undertook. Dr. Mott is known to public health workers in Canada as well as in the United States. He is a graduate in medicine of McGill University and a graduate also of Princeton. For more than ten years he worked in the United States in the field of rural health, serving as chief medical officer of the Farm Security Administration on detail from the U.S. Public Health Service, and as chief of the Health Services Branch, Office of Labor, War Food Administration. In 1946 he was asked to become chairman of the Saskatchewan Health Services Planning Commission, and in this position he has given outstanding leadership. Dr. Roemer is a physician also, with postgraduate training in sociology and experience in the study of problems of rural health.

Within a compass of 600 pages the authors present a comprehensive analysis of the problem. A brief introduction outlines the rural population in the United States, its economy and the characteristics of its life. Mortality and morbidity data are presented and reference is made to physical and mental impairments. Appropriately, these sections are limited to approximately a quarter of the volume, leaving the major portion to the consideration of the health problem, presented under the headings of Rural Doctors and Other Health Personnel, Rural Health Facilities, Medical Services and Expenditures,

Government Efforts to Improve Rural Health, and Voluntary Health Programs. In the final section, entitled The Road Ahead, the authors record the progress now evident in the provision of medical care. They leave no doubt as to their conviction that the goal is in sight and that it can be achieved by health insurance, national in scope and providing for every person.

This volume is an important contribution to the discussion of the problem of medical care.

R. D. Defries

Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. The Sixth Revision of the International Lists of Diseases and Causes of Death, Adopted 1948. Volume I. Published by the World Health Organization, Geneva, Switzerland, 1948. XXVII and 378 pages.

THE INTERNATIONAL Statistical Classification of Diseases, Injuries, and Causes of Death is the first internationally recognized morbidity-mortality classification system. The First World Health Assembly, acting on the recommendation of the Sixth Decennial International Conference, on July 24, 1948, subscribed to the use of this Classification by its member nations.

The Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death will provide the full details of the List together with an index and sufficient coding directions to afford a working basis for independent use of the system. Volume I of the Manual contains: an outline of general principles; an historical review of developments; the list of three-digit categories; supplementary classifications for special admissions, livebirths, and stillbirths; the tabular list of diagnostic terms included within each category; the new international medical certificate and its use; rules for classification to assist the compiling of medical statistics; three supplementary lists for special tabulations of morbidity and mortality data, and World Health Organization Regulations No. 1. Volume II of the Manual, comprising a com-

plete alphabetic index of terms and code numbers assigned to them, is expected to be released for distribution before the end of the present year.

The International Statistical Classification is the outcome of years of progressive effort and development. Up to 1938, main attention was directed to cause-of-death statistics. William Farr and Florence Nightingale had pressed for extension of the classification to causes of illness almost a hundred years ago but the action of succeeding international conferences did not meet the need. Not until the Sixth Decennial Revision was undertaken was the problem of morbidity classification effectively tackled.

In the detailed List of three-digit categories there are seventeen main sections compared with eighteen in the Fifth Revision. *Senility and Ill-defined Conditions* have been combined and *Chronic Poisonings and Intoxications* eliminated. A new major group, *Mental, Psychoneurotic, and Personality Disorders*, has been added.

The detailed List comprises 612 categories of diseases plus 153 categories for classification of external cause of injury and 189 categories for nature of injury. A decimal system of numbering has been adopted in which the detailed categories are designated by three-digit numbers. In many instances the first two digits designate important broad groupings while the third divides each group into categories which represent specific entities or a classification according to some characteristic such as anatomical site.

The greater part of the Manual (278 pages) is devoted to a tabular list of the inclusions covered by each category of the Detailed List and the Four-Digit Subcategories. Following this are the supplementary classifications for special admissions, livebirths and stillbirths, and the supplementary classifications of impairments. These will be of particular interest to hospitals and to those undertaking special surveys.

The need for tabulation lists of lesser detail for special purposes and for publication is recognized by the inclusion in the Manual of three shorter lists for tabulation, one of 150 causes, and two of 50 causes each. Lists such as these will be of great practical use.

The Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death will meet a real need in many quarters. The Manual will find its greatest

application in the field of vital statistics, but it is reasonably certain that the International Statistical Classification may be adopted for use in hospital morbidity statistics, the growth of which is predictable. All those who had part in producing the new classification may well feel gratified at the results. The entire material in the Manual is most effectively arranged. The typography is most attractive and readable.

In the Preface, it is stated that "the World Health Organization is offering the Manual in the hope and expectation that it will be, not merely an object of interest to medical statisticians, but the instrument for collecting information into a common pool of knowledge from which, in time, all mankind will benefit."

A. H. Sellers

Les Ultraviruses des Maladies Humaines. By C. Levaditi, M.D., and P. Lepine, M.D., from L'Institut Alfred Fournier and L'Institut Pasteur, Paris, with the collaboration of numerous distinguished workers. 2nd ed. Paris: Maloine, 1948. 2 volumes, 1907 pages. Profusely illustrated with black-and-white and coloured reproductions.

THE FIRST EDITION of this tome appeared in 1938 as a single volume, and swiftly won for itself an international reputation in the field of virology to which so many contributions to knowledge have for so long been made by the French school of thought.

Despite the ravages of war, the interruption to research, and personal hardships endured of those who strived to make the first edition a success, the second edition is an invigorating volume once again reminiscent of the happier days of French scientific study in the biological sciences. The modern expanding field of virology with its many ramifications provides a fertile field for the critic both informed and uninformed, but suffice it to say that none would have done better than those responsible for the work under the circumstances amid which it was compiled.

The chapters dealing with Yellow Fever by Mathis; Dengue by Blanc; The Nature of Viruses by Gratia; Psittacosis by Vienchange; and Ultrafiltration by Galloway, and many others, bear the hallmark of experts. The chapter on the Irradiation of Viruses by P. Bonet-Maury should be read

by every biologist who wishes to keep himself up to date in the application of atomic energy developments to the field of microbiology in general, and viruses in particular. The exclusion of the rickettsial diseases from the second edition is sad, but it reflects the great volume of virus literature now confronting the authors of such an encyclopaedic work of reference as the present one. Perhaps future reductions in the cost of printing may permit the rickettsiae to be included in subsequent editions.

This fine book should be included in the library of every medical school and physician whose duties bring him into contact with this important group of diseases.

C. E. van Rooyen

How to Tell Your Child about Sex. By Dr. James L. Hymes, Jr. Pamphlet No. 149 issued by the Public Affairs Committee, Inc., 22 East 38th Street, New York 16, 1948. 20 cents.

THE PUBLIC AFFAIRS Committee of New York, whose purpose is "to place accurate facts on current questions before the American people", use their Public Affairs Pamphlets as one means of accomplishing their aim. The Committee has produced several excellent pamphlets on health questions in the past few years. This one is no exception. It is clearly and plainly written. It handles a subject which most parents are loth to tackle, with a simple, logical approach. The list of references alone is worth the price of the pamphlet. If you distribute or recommend educational literature on health, you are advised to review this booklet.

J. H. Baillie

International Digest of Health Legislation. Vol. 1, No. 1, 1948. World Health Organization, Palais des Nations, Geneva. Canadian agents: The Ryerson Press, 299 Queen Street West, Toronto. 144 pages. \$1.25.

THIS PUBLICATION of the World Health Organization has been eagerly awaited. From 1909 until December 1946 the *Bulletin Mensuel de l'Office International d'Hygiène Publique* had included accounts of public health legislation in many countries. After a two-year hiatus, the International Digest of Health Legislation is carrying on this essential function where the Bulletin left off, commencing with regulations dated November 22, 1946.

The first issue contains much of interest to the student, teacher or practitioner of public health and of medicine in its social aspects. The requirements for nurses' training hospitals of various types and the nursing curricula in Western Australia; the detailed new decree respecting medical ethics in France and the arrangements in that country for a blood transfusion service, medical social work, and the detection of tuberculosis among teachers; regulations in various countries concerning milk, eating places, slaughter houses, biologicals, and the interment of corpses—all reward scanning by a wide range of public health workers as well as by technical specialists. The mere enumeration of these topics reminds us that familiar local problems are world-wide, and that Western culture is pretty much alike the world over. Closer scrutiny, however, reveals many differences in outlook and social organization, so that old problems are approached in a new light, and occasionally a new legislative or administrative device is demonstrated.

In a more critical vein, most of the legislation presented seems to be fairly complete and not summarized. Perhaps that is as it should be, and it is intended that the reader should do the "digesting". For legislation in this form to be of much value, however, one must first possess a complete copy of all public health enactments in force in each country as of 1946. Otherwise, to read that the following should be deleted from section 10 of the law of 1925 in Belgium is not very informative. For those who desire a complete account of foreign public health legislation, the World Health Organization should make available every five years or so, beginning with 1946, the whole body of existing health legislation for every country for which the Digest publishes the new enactments.

An equally important service to a much larger group of public health workers, we believe, would be to publish condensed versions of public health legislation in various countries. These would need to include summaries of existing legislation as well as of new enactments, and to complete the picture, an account of administrative organization and current practice in each country. The publications of the International Labour Office which summarize labour and social security legislation—and more recently medical care insurance—might in some respects serve

as models. Perhaps a co-operative arrangement could be worked out with the International Labour Office so that it would present the social and economic background,

while the World Health Organization described the public health and medical care legislation and administration.

Gordon Hatcher

NEWS

Appointment of Miss Mary J. Angus

MISS MARY J. ANGUS has been appointed assistant executive secretary of the Canadian Arthritis and Rheumatism Society. She was formerly assistant to the director of the Nutrition Division of the Department of National Health and Welfare.

Miss Angus is a graduate in dietetics from McGill University and obtained her M.S. degree in public health nutrition at Simmons College in Boston, in affiliation with the School of Public Health of Harvard University. She has had extensive experience in the field of public health, having worked with the Oregon State Department of Public Health, the Medical Division of the Vancouver Welfare Department, and Grasslands Hospital, New York. She served overseas with the Canadian Forces.

British Columbia

DR. J. M. M. WHITBREAD, who recently joined the staff of the Department of Health, has become the director of the newly formed Upper Fraser Valley Health Unit with headquarters at Chilliwack. This unit has become possible as a result of the decision of the City of Chilliwack, the Municipality of Chilliwack, the Municipality of Kent, and the school boards for school districts no. 33 (Chilliwack) and no. 76 (Kent) to unite their school and local health services under a Union Board of Health.

MISS YVONNE LOVE, consultant in nutrition with the Department of Health, has been seconded to the Hospital Insurance Commission to develop a consultant nutrition program for the hospitals, assisting with advice to hospitals in all phases of food service.

PROGRESS toward the beginnings of a preventive dental program for British Columbia is being made as a result of discussions between department officials and representatives of the dental profession. A committee of the British Columbia Dental Association has been set up to cooperate in the planning of the program, which will be designed to provide

dental services, with emphasis on the prevention of dental caries. Personnel of the committee are drawn from representatives of the College of Dental Surgeons and members of the Dental Association representing various geographical areas of the province.

MRS. KAY BEARD, consultant in health education to the Provincial Department of Health, has been working with the Division of Curriculum of the Department of Education on the revision of the Health Curriculum for B.C. Schools.

Alberta

ON FEBRUARY 1ST the Provincial Department of Public Health assumed responsibility for free treatment of non-pulmonary cases of tuberculosis.

SEVERAL NEW BUILDINGS are nearing completion on the grounds of the Central Alberta Sanatorium, Calgary. These consist of a residence for women on the staff, a building to house the library and chapel, an auditorium, and buildings to house the Southern Branch of the Provincial Laboratory.

THE NEW ABERHART MEMORIAL SANATORIUM is under construction in Edmonton.

Saskatchewan

DR. THOMAS ALASTAIR WATSON has been appointed Director of Cancer Services for the Province. His appointment includes the actual direction of the Allan Blair Memorial Clinic, Regina, and of the Saskatoon Cancer Clinic, as well as the duties of the Director of Cancer Services. Dr. Watson was born at Masterton, New Zealand, in 1914 and graduated from the Otago Medical School of the University of New Zealand in 1937 with the degrees of M.B. and Ch.B. In 1938 he joined the International Red Cross organization in the war zone in China and practised surgery there for one year. In 1939 he joined the staff of the Royal Cancer Hospital in London, England, with the primary object of studying radiotherapy, and obtained the Diploma in Medical Radiology from London University

in 1940. In the same year he was awarded the Chester Beatty Scholarship for work in radiology. From 1940-44 he was on the staff of the Christie Hospital and Holt Radium Institute in Manchester. In 1944 he was appointed by the Liverpool Cancer Control organization as radiotherapist to the Royal Infirmary in Liverpool, where he remained until November 1946, when he came to Canada to join the staff of the Saskatchewan Cancer Commission as director of the Saskatoon Cancer Clinic.

THE DIVISION OF HEALTH EDUCATION of the Provincial Department of Public Health has undergone some changes in personnel during the past two months. Mr. James D. Ward, who has been with the Division for some years, is acting as director, and the following appointments to the staff have been made: Mr. Harry Chalmers, health educator for the North Battleford Health Region; Miss Marion Shaw, health educator for the Moose Jaw Health Region; Miss Rowena B. O. Hawkings, publicist for the Division in Regina; Mr. Donald French, health educator for the Assiniboia Health Region; and Mr. Philip Lescelleurs, health education consultant, Regina.

MISS JEAN ODDIE, provincial nutritionist for the Department of Public Health in Saskatchewan, has received the degree of M.Sc. in Public Health Nutrition from the University of Michigan at Ann Arbor. At present she is doing field work in the United States in order to become acquainted with nutrition programs in the District of Columbia, New York State, Georgia, Tennessee, and Michigan. She will resume her duties as provincial nutritionist in September.

Manitoba

MISS MARGARET E. NIX, director of health and welfare education for the Province, returned to Winnipeg last month after a five-week tour of Newfoundland. Miss Nix, who was the only provincial representative on the Dominion Government's health survey team, visited all the government and voluntary agencies in Canada's tenth province, as well as several outports.

RATEPAYERS of the districts of Shoal Lake and Morden, two hospital areas established under the Manitoba Health Plan, recently voted overwhelmingly in favour of the construction of six new hospitals. These will provide an additional 96 badly needed hospital

beds for about 19,000 people in rural Manitoba. Under the Dominion-Provincial hospital grant, Shoal Lake hospital district will receive \$62,000. Almost one-half of this will go for a 20-bed district hospital in the village of Shoal Lake. The remainder will be used to construct a medical nursing unit in the village of Rosburn and a 4-bed nursing station at Elphinstone. Eighty-eight thousand dollars of the \$124,000 government grant to the Morden Hospital District will be used for the remodelling and extension of the present hospital in the town of Morden. This extension will provide 20 beds for chronic and convalescent cases. The remainder of the grant will be used for the construction of 6-bed medical nursing units in the villages of Pilot Mound and Manitou.

Ontario

MISS PEARL M. STIVER, Reg.N., B.S., assumed the position of Director of Public Health Nursing for the Ottawa Board of Health on June 1st. Miss Stiver is a native of Simcoe County. After graduating from the Toronto Western Hospital School of Nursing, she engaged in private nursing for several years. After completing the Certificate Course in Public Health Nursing at the University of Toronto in 1941, she joined the staff of the Division of Public Health Nursing, Department of Public Health of Toronto. When the wartime venereal disease control program was initiated, Miss Stiver was loaned to the Ontario Department of Health, Division of Venereal Disease Control, and later she joined the Division staff as Public Health Nursing Consultant. Her success in this field of nursing and epidemiology was recognized throughout the Province. On April 1, 1949, Miss Stiver transferred to the Division of Public Health Nursing. In 1947, after a period of study at Teachers College, Columbia University, New York, she received the Bachelor of Science degree.

MISS BLANCHE BISHOP, for the last four years industrial nurse with George Weston Ltd., Toronto, has joined the staff of the Division of Industrial Hygiene of the Provincial Department of Health. She is a graduate of the Public Health Nursing course and has had several years' experience with the University of Chicago Clinics and with the Victorian Order of Nurses in Toronto.

